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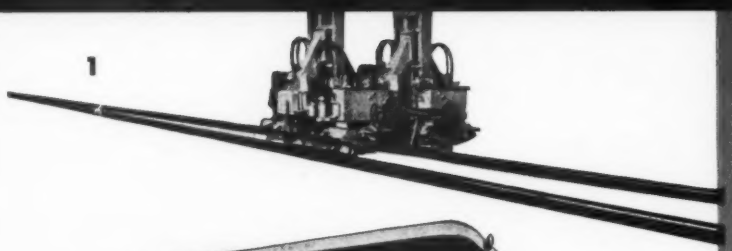
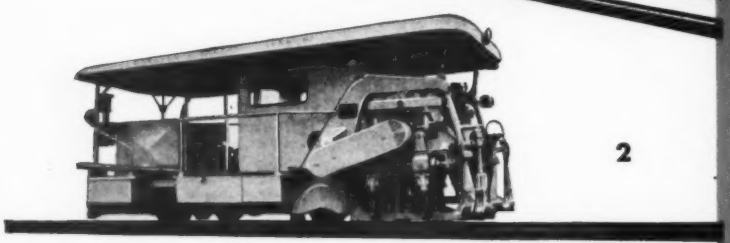
Railway TRACK and STRUCTURES

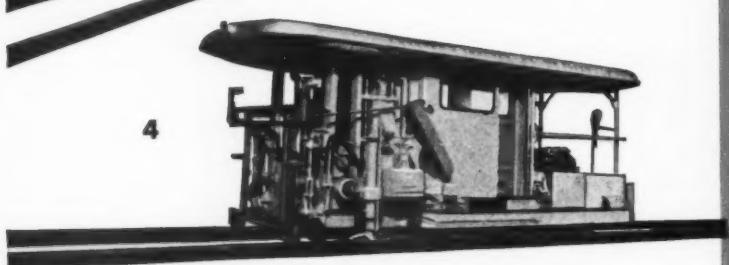
December 1961

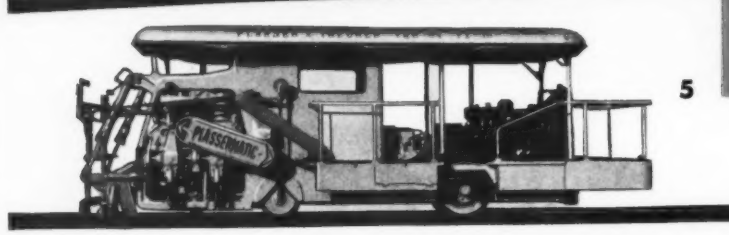
Timber tunnel lining treated in place ..... p. 24

A Simmons-Boardman TIME-SAVER Publication









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DECEMBER

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Published monthly by Simmons-Boardman Publishing Corporation. James G. Lyne, Chairman of the Board, Arthur J. McGinnis, President and Treasurer, Duane C. Salisbury, Executive Vice-President, Harry H. Melville, John R. Thompson, John S. Vreeland, Robert G. Lewis, M. H. Dick, Joseph W. Kizzia, Michael J. Figa, Jr., C. J. Fisher, Vice-Presidents, George Dusenbury, Vice-President and Editorial and Promotion Director.

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BRANCH OFFICES: 1081 National Press Bldg., Washington 4, D.C.; 1501 Euclid Ave., Cleveland 15; Terminal Sales Bldg., Portland 5, Ore.; 916 Kearney St., San Francisco 11; 1336 Wilshire Blvd., Los Angeles 17; 3915 Lemmon Ave., Dallas 19, Tex.; Suite 203, Carlton House, Pittsburgh 19, Pa.; 22 Eighth St., N.E., Atlanta 9, Ga. FOREIGN REPRESENTATIVES: Max F. Holsinger, 67/68 Jermyn St., St. James's, London S.W. 1, England; Max F. Holsinger, Huttenstrasse, 17, Am Ernst-Reuter-Platz, Dusseldorf, Germany.

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Subscription price to railroad employees only in the U.S., U.S. possessions, Canada and Mexico, $2.00 one year, $3 two years, payable in advance and postage free. All other countries, $8 one year, $16 two years. Single copies 75¢. Address all subscriptions and correspondence concerning them to: Subscription Department, Railway Track and Structures, Emmett Street, Bristol, Conn. Changes of address should reach us three weeks in advance of the next issue date. Send old address with the new, enclosing, if possible, your address label. The Post Office will not forward copies unless you provide extra postage. Duplicate copies cannot be sent.
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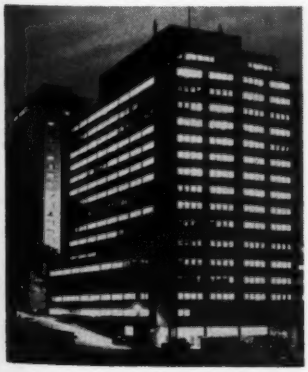

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Don't miss . . .

Canadian National "Panorama of progress" issue. A special report will analyze this company's engineering and maintenance-of-way practices in depth, with emphasis on progress in modernization and mechanization.

. . . in the January issue

Gulf's 4-point plan can help you of your off-track equipment . . .

Here's what this four-point plan includes: (1) the use of high quality lubricants and fuels throughout your system to keep equipment operating smoothly and continuously, (2) expert petroleum engineering counsel to help you select the types and grades of lubricants and fuels best suited to your equipment and operating conditions, (3) simplified lubrication to avoid unnecessary ordering, handling and storage of lubes, and (4) prompt delivery service when and where you need it.

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And now, this experience can work for you in the form of a well-planned program that will insure efficient, dependable performance of your off-track equipment. Gulf's 4-point plan can be the key to increasing the effectiveness of your maintenance program.

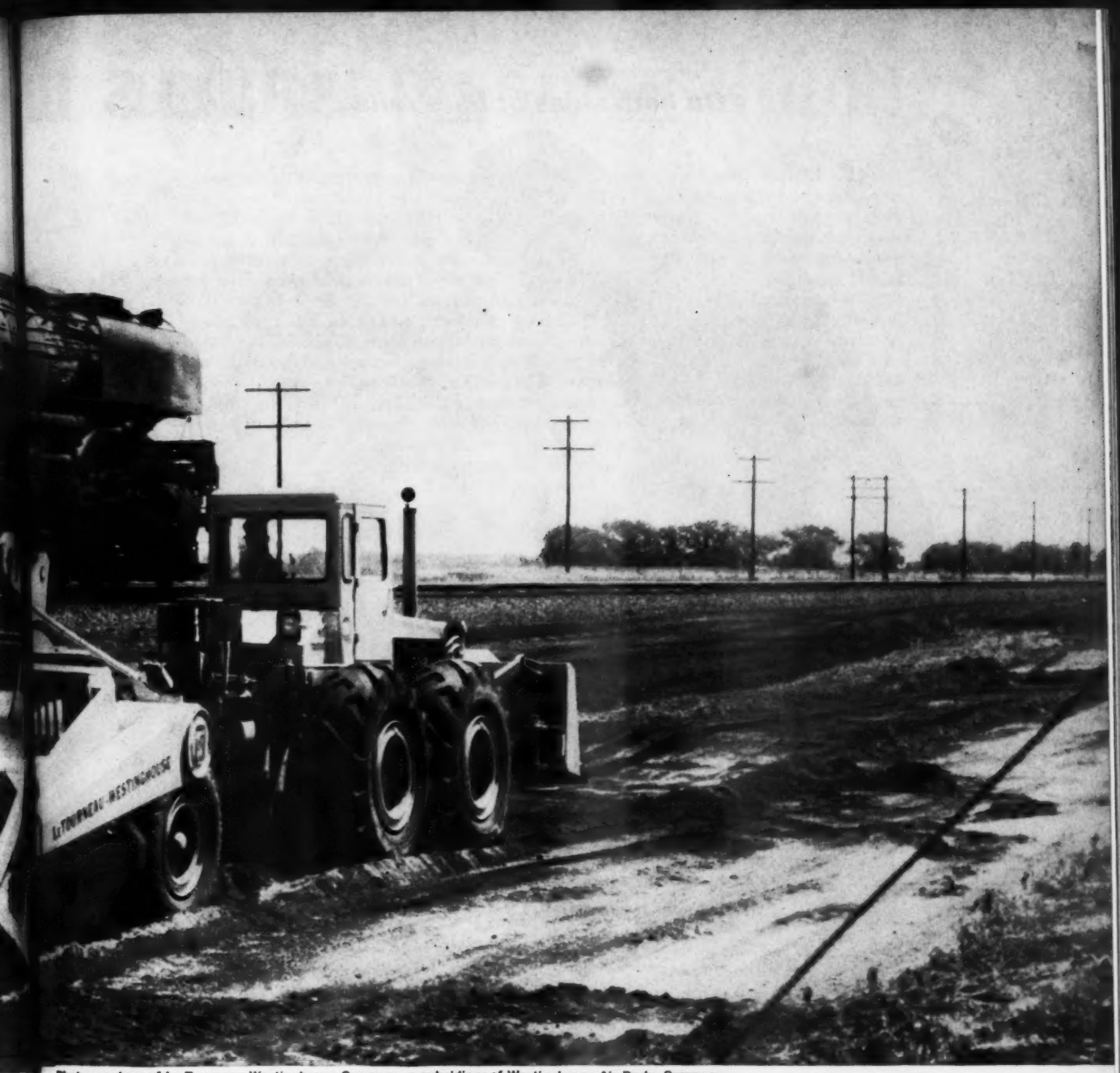

Photo courtesy of Le Tourneau Westinghouse Company, a subsidiary of Westinghouse Air Brake Company.

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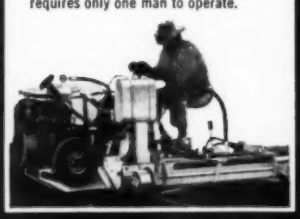
W08 SERIES B HYDRAULIC TIE REMOVER removes one tie in less than a minute, requires only one man to operate.



W90 SERIES A TIE HAN three jobs—removes, inse positions ti man

TO 1200 SPIKES PER HOUR!

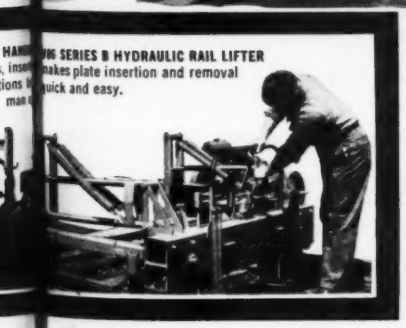
FAIRMONT HYDRAULIC SPIKE PULLER. One man operates the Fairmont W84 Series B Hydraulic Spike Puller—and pulls spikes from *both* sides of *both* rails, while working in one direction! This makes W84 ideal for lowering the cost of tie renewal work or most any spike pulling job. As the arrow indicates, the support carriage moves into position directly over the spikes on either side of either rail. A ball and socket allows the pulling assembly to tilt to the right angle.

Working speed of the Fairmont Spike Puller is 15-20 spikes per minute or up to 1200 spikes per hour! Maximum force is exerted at the start of the pulling stroke to pull out the spike in one quick stroke! Hydraulic energy is stored up by an accumulator, making possible a smaller, more economical engine and pump.

Good balance helps provide stability and a lower center of gravity for easier handling . . . two men can put the W84 on or off the track in two to three minutes. The pulling assembly takes all the load, with the two channel-shaped jaw guides bracing against the pulling force. The operator never comes in contact with the pulling assembly!

Speed, safety, ease of operation—these are time and cost saving advantages the Fairmont W84 Series B Spike Puller can bring to your track work! Write for details today.

**Fairmont Equipment is available for lease.*



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TIE-REMOVING TEAM IS STILL THE PERFECT COMBINATION FOR FAST TIE REMOVAL AT LOWEST COST, HIGHEST EFFICIENCY!

ILLUSTRATED BELOW: The Famous Model NU, WOOLERY Tie Cutter

Heavier rail and double shoulder tie plates have made the job of removing tie-ends an increasingly difficult one—but not for the WOOLERY team—the WOOLERY TIE CUTTER and the WOOLERY TIE-END REMOVER!

And still without trenching, jacking up track or disturbing the tie bed!

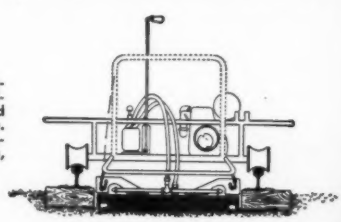
The WOOLERY Tie-Cutter cuts the tie on both sides inside the rail. The center section is then easily removed with tie-tongs and the Tie-End Remover moves in.

Maintenance men have discovered that welded rail, heavier rail, double-shoulder tie plates, *more* and *heavier* and *faster* trains have not slowed down WOOLERY efficiency.

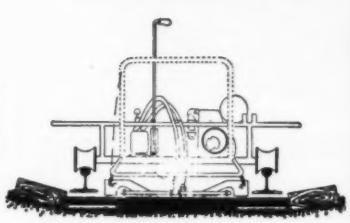
One man can still remove tie ends with no more effort than it takes to turn the air-valve on the Tie-End Remover!

It's done in less than a minute—in fact, it's so fast that the truly efficient team consists of TWO Tie-Cutters working ahead of the Tie-End Remover!

The WOOLERY Tie-End Remover consists of a double-ended hydraulic cylinder which drops into the tie bed left by removal of the center section. Note that there has been NO trenching or jacking! Keeps track smooth, safe!



A simple turn of the valve shoves the tie-ends outward—completely clear of the rail, pushing ballast ahead of it to open crib for the new tie! Hydraulically powered pistons work equally well and fast with single or double shoulder tie plates.



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UROX® KILLS WEEDS for a longer time, at lower cost!

That's right! With General Chemical's powerful UROX Weed Killer you can actually stop weeds on your system for a longer time and at lower cost than you ever thought possible, here's why:
UROX is so effective just one application wipes out weeds and brush for as long as 8-18 months! Results carry over, too! Because the effects of UROX are cumulative, herbicidal action can be continued year after year with small "booster" treatments. UROX is available in both liquid and granular forms.

Clear the tracks! There's nothing that's going to interfere with top maintenance efficiency on this road. One treatment of UROX kept this road bed in top condition all season long.

This siding switch was covered with weeds until UROX was used to clean up the problem. Heavy vegetation problem is shown along side of the treated strip.

What happened here? You guessed it. UROX was used only in foreground for demonstration purposes. Dense Florida growth chokes the untreated background.

UROX is excellent along track installations like this perfectly maintained New Jersey tankcar loading depot.

Before applications of UROX were used, maintenance men could not hold down weeds here successfully. *After* one UROX treatment weed control is underway.

For more information on UROX and URAB, write, Weed & Brush Killer Dept. General Chemical Division, Allied Chemical Corporation, 40 Rector Street, New York 6, N.Y.

For brush control along right-of-ways, in yards, etc., Allied Chemical's URAB® kills toughest deep-rooted brush, briars, even weed trees . . . gives up to 100% control with a single application.

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GENERAL CHEMICAL DIVISION
40 Rector Street, New York 6, N. Y.

Is track adequately maintained today?

What is the over-all condition of main-line trackage in the United States today?

Many track men, when faced with this question, will doubtless take the position that the trackage generally has undergone deterioration in recent years. A track man is particularly apt to have this point of view if he works for a railroad on which maintenance money has been unusually scarce.

On the other hand there is another school of thought which holds that railroad trackage generally has undergone little or no deterioration. At any rate, those in this group seem pretty well convinced that the track structure generally is adequate for carrying the loads imposed on it at the present time. Some of them imply that, in their opinion, much of our trackage has been over-maintained in the past.

The argument between these two schools of thought is one that can go on indefinitely without either side conceding the other is right. This is so because there is no way in which either point of view can be proved by incontrovertible facts.

The matter really goes back to the subject of deferred maintenance. The term "deferred maintenance" came into being years ago as a means of describing a situation in which, due to retrenchment, the amount of work done on the tracks and other fixed properties fell below a certain level that was considered to represent the annual needs. It was assumed that the work that remained undone was merely deferred, that is, it would be made up in a subsequent year. But as time went by it became apparent that "deferred maintenance" was a vague term and that the railroads could apparently go on indefinitely "deferring" work and without making up all the work that had been "deferred." This is doubtless why the term "deferred maintenance" is not used as frequently as it was a few years ago.

Perhaps the answer to the confusion that exists over the condition of the tracks today, and also regarding the meaning of the term "deferred maintenance," lies in the character of the track structure itself. Railroad track is an engineered structure, and like all engineered structures it is built with a factor of safety. But track, because of variations in the subgrade and other factors, is not susceptible to the same exact mathematical analysis as some other structures, such, for example, as bridges.

Track men are cognizant of this situation. They cannot be blamed, therefore, if they display a tendency to beef up the factor of safety of the tracks under their supervision. What may have appeared to be over-maintenance in the past may have been nothing more nor less than a desire to assure an adequate factor of safety. The question today, and it's an important one, is this: How much liberty can be taken with the factor of safety left in the track?

Cycle maintenance

The theory behind cycle maintenance is that work will be done at certain time intervals and then at the end of that period will be repeated. Under this plan, tie renewals are made at five, six or seven-year intervals.

Ballasting operations will likewise be carried out at certain intervals, preferrably timed to coincide with tie-renewal operations. About midway in the cycle, the track may be resurfaced and given a small raise. Between surfacings and ballasting work, the track may be given a "skin lift" or smoothed by suitable mechanized equipment.

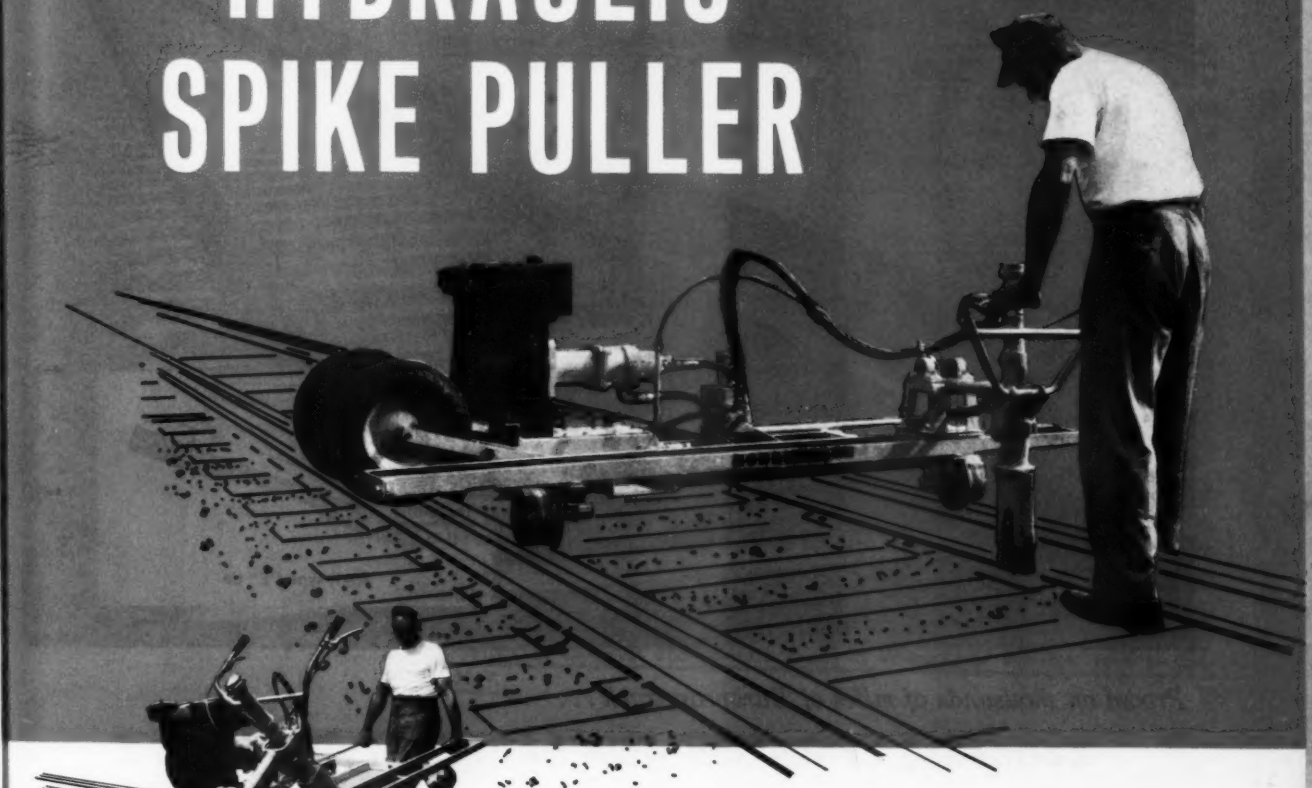
The theory is fine but how has it worked out? Many railroads have attempted to place track maintenance on a cycle basis, but how many have attained this objective? Most track men say they have adopted cycle maintenance but that they are now extending the cycle. Others seem to evade the question by saying it takes several years to get on a cycle basis. One maintenance officer said he is "too busy putting out fires to stay on a cycle basis."

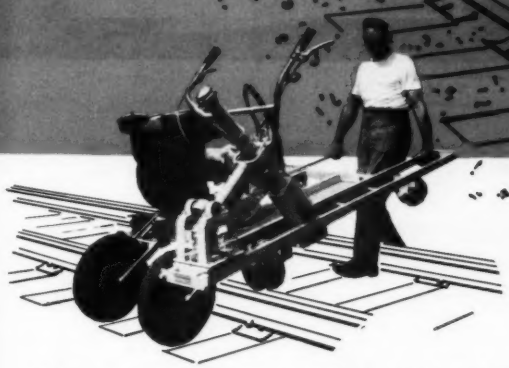
What is actually happening is that, when maintenance allotments are curtailed through a business decline, work is deferred until the following year. That disrupts the cycle. In the ensuing year the allotment may not be sufficient to do the deferred work plus all that called for by the cycle. So the cycle is lengthened.

These experiences would seem to indicate that regular annual maintenance appropriations are a prerequisite to the success of cycle maintenance. Until such appropriations are possible true cycle maintenance cannot be considered a practicable goal.

Nordberg presents the all new Model "C"

HYDRAULIC SPIKE PULLER





Compact...Simple...Fast...and Efficient

This is a brief but accurate description of Nordberg's newest "Mechanical Muscle"® . . . the Model C Hydraulic Spike Puller.

Designed for pulling spikes on both rails, this new "tie gang" spike puller is truly a one-man machine. It's balanced in such a way that one man can set it on or off the track in wheelbarrow fashion. Because the pulling gun is mounted on a telescoping boom supported by the traversing carriage, the operator bears none of its weight.

A convenient "handlebar" lever on the pulling gun provides simple, positive control of the operating valve. Pulling claws are of the gripping type with easily replaceable jaws, and will pull *any* spike in practically *any* condition . . . as proved by extensive field testing.

Call or write for further details about the new Nordberg Model C Hydraulic Spike Puller and find out how this versatile machine can cut costs in your tie gang operations.

SPECIFICATIONS:

- **Working Weight: 594 lbs.**
- **Engine: 8.25 hp Briggs & Stratton**
- **Pulling Gun Machine Supported**
- **Will Operate Switchliners**

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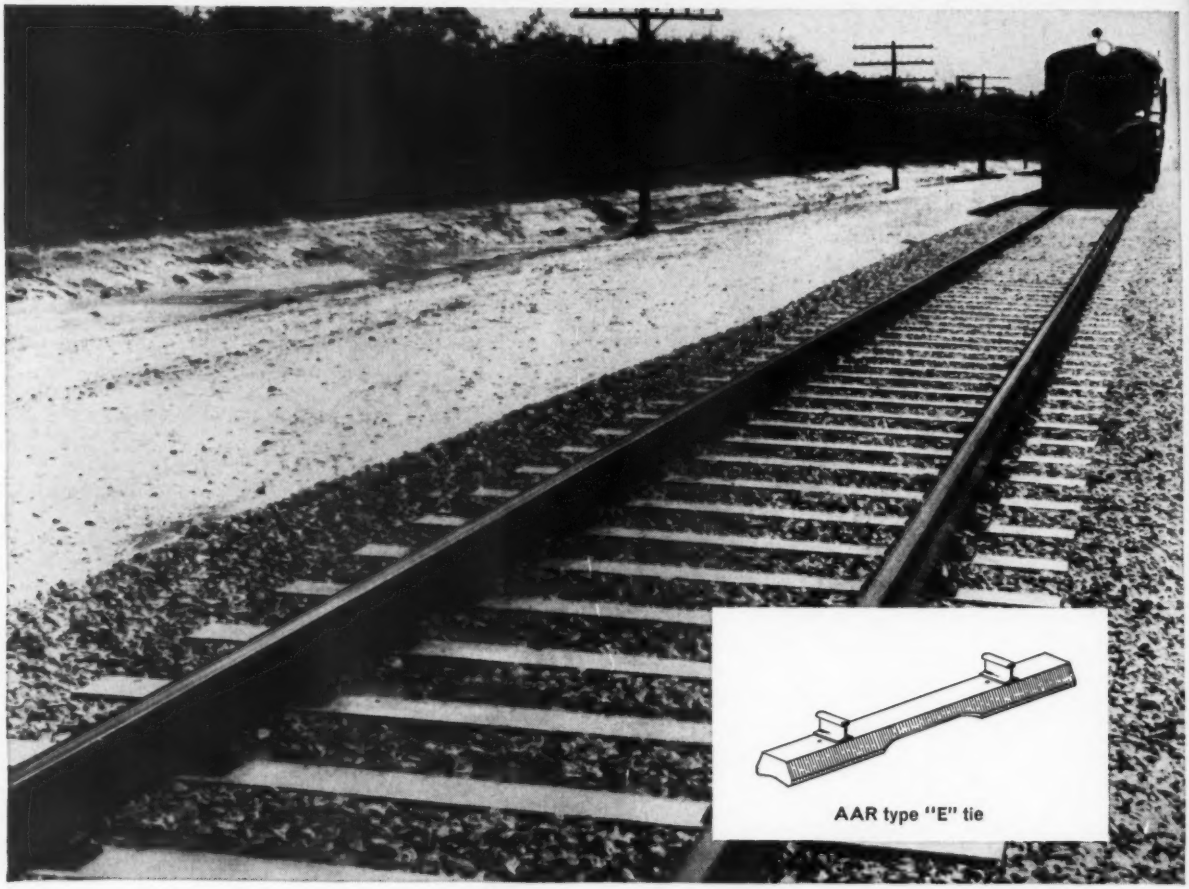


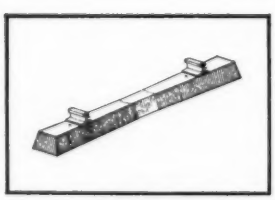
Proved on thousands of miles of European track . . .

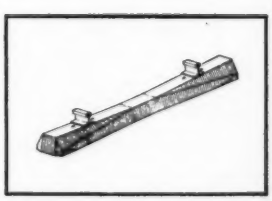
concrete crossties now being service-tested on eight North American railroads

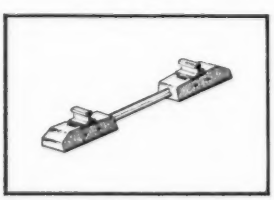
Atlantic Coast Line and Seaboard Air Line were the first U.S. railroads to install trial sections of concrete crossties. Now 6 other U.S. and Canadian Railroads are running trains with new comfort and smoothness over stretches of similar track. Additional test installations are planned by other railroads.

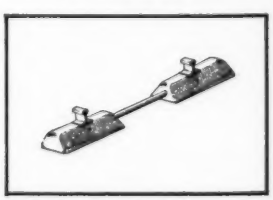
In Europe, concrete crossties are no longer an experiment. A recent investigation in England, Sweden, France and Germany shows wide use of concrete crossties, particularly with welded rails. With concrete ties, wider spacing may be practical. Two concrete ties are given the job of three conventional wood ties. The greater anticipated service life and expected lower upkeep of concrete ties promise big savings in track maintenance. Engineers expect concrete ties to last 50 years or longer.

Write for literature and information on recent installations of concrete crossties. A film is also available. (U.S. and Canada only.)


Gerwick type tie


German B-58 type tie


French R.S. type tie


Swedish 101 type tie

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A national organization to improve and extend the uses of concrete

NEWS NOTES

. . . a résumé of current events throughout the railroad world

Net income of Class I railroads in September amounted to $41 million, appreciably up from the September 1960 figure of $26 million. In the first nine months of 1961 net income was $182 million, down from 1960's $304 million. Thirty-three Class I roads failed to earn their fixed charges during this year's first nine months. Rate of return for all Class I roads during the 12 months ended with September averaged 1.71 per cent.

The New York Central and Pennsylvania have resumed merger negotiations after a lapse of nearly three years. In a joint statement on November 8 the two roads announced that they would ask the ICC for permission to merge as soon as satisfactory terms could be agreed upon. This merger would create a 20,131-mile, $5-billion system which, according to the previous studies, would save the combined roads at least $100 million a year. These former studies have been turned over to new joint committees which will "progress negotiations to an early conclusion." Observers, however, expect considerable time to elapse before the merger is consummated.

Erie-Lackawanna again has entered the Norfolk & Western-Nickel Plate-Wabash merger picture. After first asking to be included in the N&W's plans, then opposing the three-way merger, the E-L now has agreed to withdraw its objection in return for ". . . consultations and negotiations in an attempt to find a plan for some form of affiliation between the Erie-Lackawanna and the enlarged N&W system . . ." In fact, the E-L and Nickel Plate are making plans, already approved by the boards of directors, to construct and operate jointly a 49-track, $7.5-million yard at Buffalo, N. Y.

In the largest rail movement of troops and military supplies since the Korean "police action," railroads again demonstrated their importance to the country. The movement consisted of transporting Wisconsin's federalized 32nd National Guard (Red Arrow) Division 2,000 miles to its training site at Fort Lewis, Wash. Four roads —Milwaukee, Chicago & North Western, Northern Pacific and Soo Line—furnished equipment, including over 700 freight cars and enough passenger equipment to make up 17 special troop trains. Piggyback and Flexi-Van were used for the first time in such a move.

An automated transit car, demonstrated by the General Electric Company at its Erie, Pa., plant in November, was hailed as "one of the developments which will hasten the building of more efficient public transportation systems." Equipment for the demonstrator car is based on a decentralized speed-distance regulator concept which was chosen from a number of possible alternatives after evaluation with analog computer simulation. At the demonstration the car was operated over a test track, making simulated station stops, opening and closing its doors, and accelerating to programmed speeds between stations. "Fail safe" features are incorporated in the automated equipment.

Secretary of Commerce Hodges' report on the nation's transportation problems now has been sent to President Kennedy who will use it in framing a transportation message to Congress. Contents of the report had not been made public at the time this issue went to press. However, the report "in all likelihood will affirm the belief that a strengthening of enforcement procedure is needed to protect the regulated common carrier from the depredation of illegal operators." This statement was made in an address by ICC Commissioner C. E. Herring before the Pennsylvania Motor Truck Association at Philadelphia.

NEWS ABOUT PEOPLE

E. J. Ruble
AAR Research Staff

F. P. Drew
AAR Research Staff

O. G. Linde
NWP

T. D. Wofford, Jr.
Illinois Central

AAR RESEARCH STAFF—E. J. Ruble, research engineer structures, has been promoted to executive research engineer, effective October 17, in which capacity he succeeds to the duties of **E. E. Cress,** principal research engineer, who retired on August 31. **Freeman P. Drew,** assistant research engineer structures, has been appointed research engineer structures to succeed Mr. Ruble.

BURLINGTON—D. W. Stevens, track supervisor at Oxford, Neb., has been promoted to roadmaster at Denver, Colo., succeeding **H. C. Arnold,** resigned.

CHESAPEAKE & OHIO—N. R. Withrow, supervisor track at Russell, Ky., has been promoted to general track supervisor at Grand Rapids, Mich.

Ellis O. Fortney, assistant supervisor track at Huntington, W. Va., has been promoted to supervisor track at Russell, Ky. Mr. Fortney is succeeded by **E. E. Nichols, Jr.,** assistant cost engineer at Raleigh, N. C., who in turn is succeeded by **James E. Snead,** assistant engineer at Huntington. **Benjamin C. Richmond,** assistant supervisor track at Walbridge, Ohio, has been promoted to supervisor track at Logan, Ohio.

CHICAGO UNION STATION—J. M. Crevie, chief clerk to chief engineer, has been promoted to office engineer, succeeding **M. B. Wood,** promoted.

DULUTH, MISSABE & IRON RANGE—The following appointments have been made:

Roger J. Aschmeyer to engineer track at Duluth, Minn.; **Norman E. Johnson** to assistant engineer bridges and buildings at Proctor, Minn.; **Vernon L. Ljungren** to office engineer at Duluth; **Douglas R. Tripp** to resident engineer at Virginia, Minn.; **Jack A. Zeleznikar** to structural engineer I; **John P. Bergson** to structural engineer III; **Helmer E. Holm** to assitant roadmaster at Proctor; and **Robert G. Huston** to assistant roadmaster at Two Harbors, Minn.

FRISCO—G. L. Harris, division engineer at Springfield, Mo., has been promoted to assistant principal engineer there. **G. C. Payne** has been appointed division engineer at Chaffee, Mo., succeeding **C. A. Peebles** who has been transferred to Springfield, succeeding Mr. Harris.

In addition, the following changes have occurred recently: **H. F. Kanute,** engineer design at Springfield, to engineer layout and design there; **R. W. Palmerton,** senior assistant engineer at Springfield, to engineer costs there; **H. E. Bartlett,** assistant engineer at Springfield, to engineer surveys and plans there; **T. F. O'Rourke,** office engineer at Springfield, to engineer records there; **L. F. Woodlock,** roadmaster at Hugo, Okla., to division engineer at Enid, Okla.; **F. S. Hunter,** assistant roadmaster at Memphis, Tenn., to roadmaster at Ft. Scott, Kan.; **R. D. Wheat** to assistant roadmaster at Ft. Scott; **C. B. May** to assistant roadmaster at Springfield; **T. M. Adams** to assistant roadmaster at Amory, Miss.; and **D. E. Jones** to assistant roadmaster at Tulsa, Okla.

ILLINOIS CENTRAL—H. E. Graham, superintendent water service at Chicago, has been promoted to superintendent water service and scales there. In addition to his former duties, Mr. Graham assumes the duties of **C. C. Jacobson,** superintendent scales at Centralia, Ill., deceased. **M. B. Parker,** scale inspector at Centralia, has been promoted to assistant superintendent scales there.

SEABOARD—A. B. Merritt, Jr., assistant to division engineer at Raleigh, N. C., has been promoted to assistant division engineer there. **O. L. Oliver,** assistant roadmaster at Hamlet, N. C., has been promoted to roadmaster at Birmingham, Ala., succeeding **W. M. Anderson** who has retired after more than 50 years of service.

SOUTHERN—Robert W. Fondren, assistant division engineer at Greenville, S. C., has been promoted to division engineer at Winston-Salem, N. C., succeeding **Alvin E. Chambers** who has been transferred to Somerset, Ky.

Biographical briefs

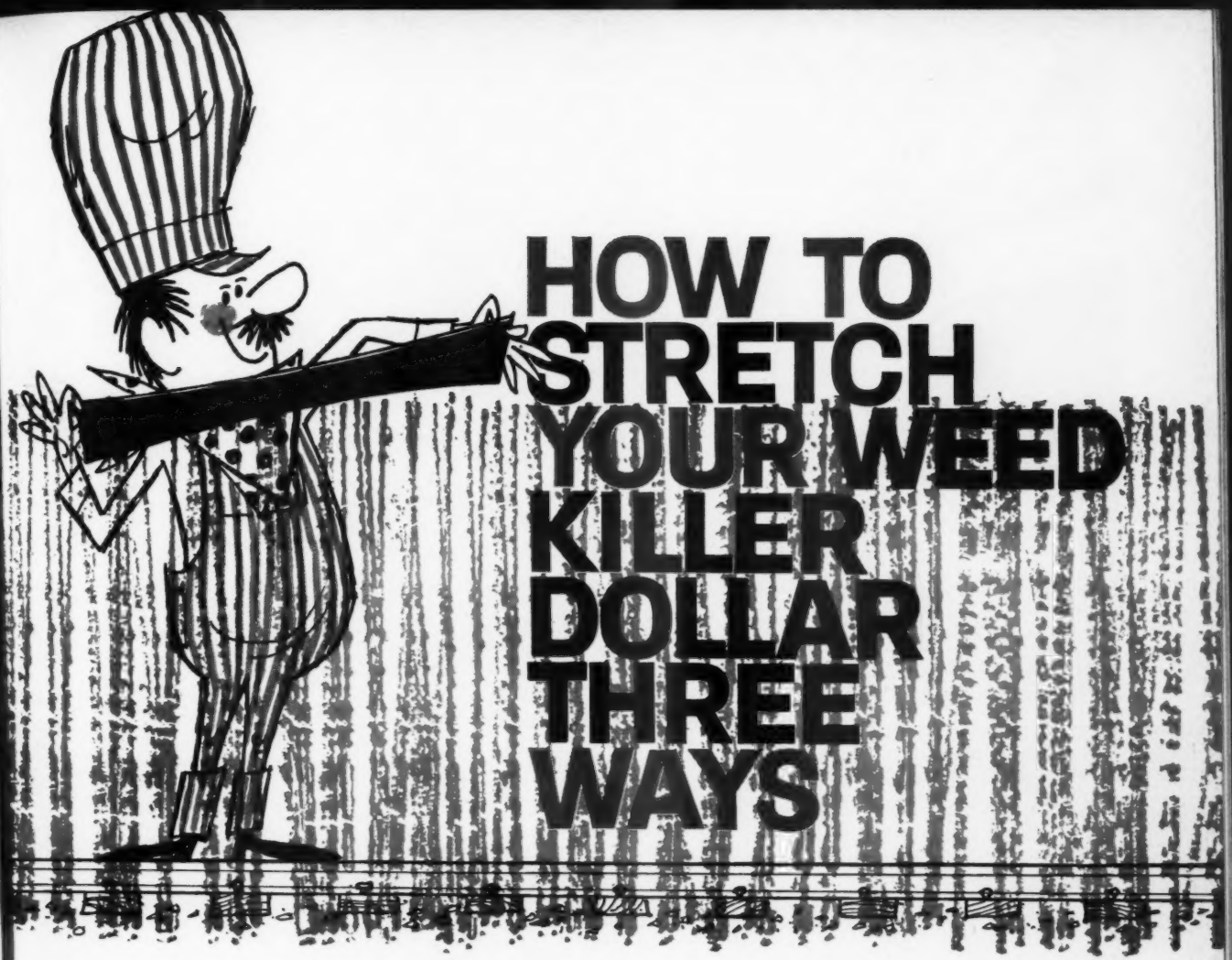
O. G. Linde, 35, who was recently promoted to division engineer of the Northwestern Pacific at San Rafael, Calif. (*RT&S*, July, p. 10), was born at Hede, Sweden, and graduated from the Technology Institute of Stockholm in 1948 with a Bachelor of Science degree in civil engineering. He also attended Stanford University as a participant in the Stanford-Sloan program in executive management at the Graduate School of Business. Mr. Linde entered railway service on the Southern Pacific, parent company of the NWP, in 1950, serving in various engineering capacities up to assistant engineer. In 1954 he was appointed assistant engineer on the NWP and two years later was promoted to assistant division engineer. Mr. Linde was appointed senior assistant division engineer on the SP at Los Angeles, in 1958, the position he held at the time of his recent promotion.

Thomas D. Wofford, Jr., who was recently promoted to staff engineer of the Illinois Central at Chicago (*RT&S*, Sept., p. 10), is a graduate of the University of Illinois. He entered the service of the IC in 1946 as a junior engineering aid in the bridge department at Chicago. In 1950 he was promoted to assistant engineer there. Mr. Wofford was further promoted to engineer of design at Chicago in 1955, the position he held at the time of his recent promotion.

James H. Brown, 34, who was recently promoted to chief engineer of the Frisco at Springfield, Mo. (*RT&S*, Sept., p. 10), was born at St. Louis, Mo., and graduated from the University of Missouri in 1948 with a Bachelor of Science degree in civil engineering. Mr. Brown entered the service of the Frisco in 1948 as a student apprentice at Chaffee, Mo., later being transferred to Memphis, Tenn. He was promoted to student supervisor at St. Louis in 1950, assistant roadmaster at Ft. Worth, Tex., later that year, roadmaster at Chaffee in 1951 and assistant division engineer at Ft. Scott, Kan., in 1954. Mr. Brown was further promoted to division engineer at Ft. Worth in 1955, assistant chief engineer-construction at Springfield in 1957 and assistant chief engineer, Western district, in 1959. He was serving in the latter capacity at the time of his recent promotion.

Henry F. Davenport, 35, who was recently promoted to assistant to chief engineer on the Illinois Central at Chicago (*RT&S*, Sept., p. 10), was born at Grand Rapids, Mich., and graduated from the University of Michigan in 1946 with a Bachelor of Science degree in engineering. Mr. Davenport entered the service of the IC in 1946 as an engineering aid at Paducah, Ky., later being transferred to Champaign, Ill. He was promoted to assistant supervisor at Paducah in 1948, to supervisor track at Mendenhall, Miss., in 1950, serving also in that capacity at Tutwiler, Miss., and Corinth, and to assistant to division engineer at Memphis, Tenn., in 1955. Mr. Davenport was further promoted to division engineer at Memphis in 1957 and staff engineer at Chicago in 1960. He was serving in the latter capacity at the time of his recent promotion to the position of assistant to chief engineer.

(*More biographical briefs on page 46*)



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Harold Kellogg

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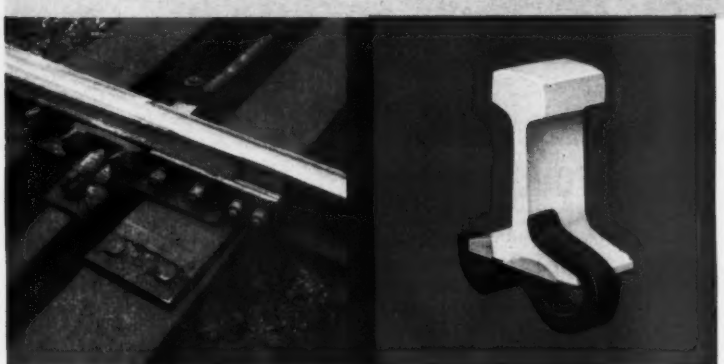

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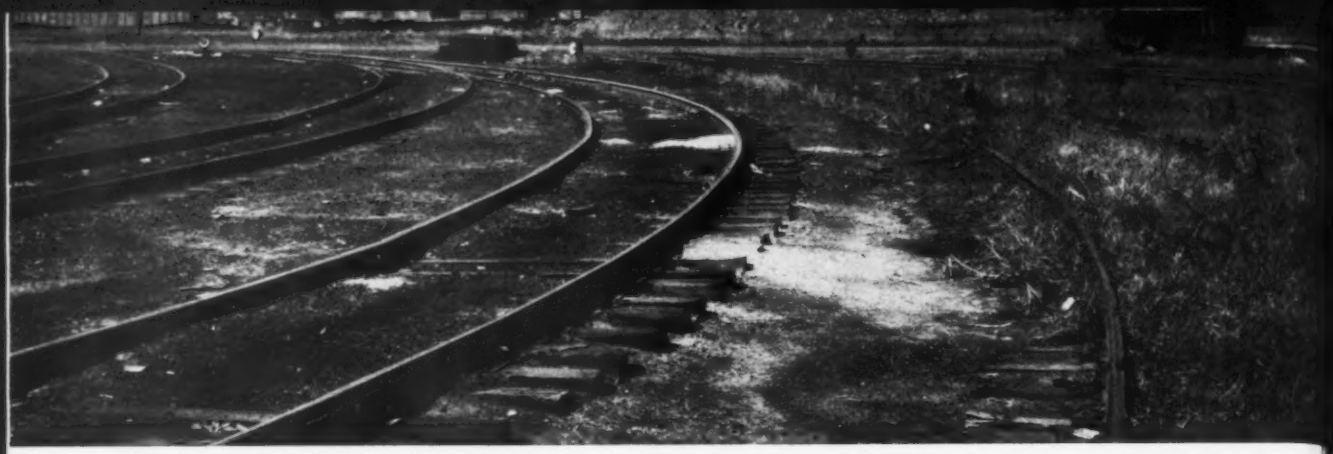
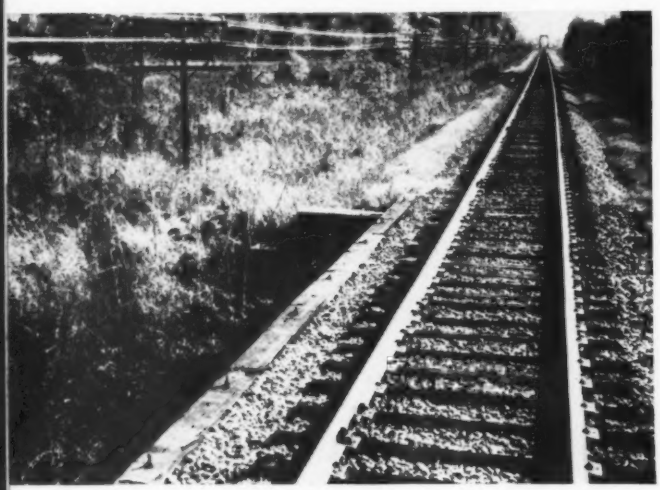


WEEDS AND GRASSES

One-application control—The Reading Company sprayed Du Pont KARMEX® diuron in their Port Richmond, Philadelphia, yard early last spring. This is how the yard looked in August. Note the complete weed control in the treated area, left, compared with the vegetation in the untreated area at right. "Karmex" diuron or TELVAR® monuron weed killer (depending on local conditions) is the key to a long-lasting weed control program. In large-scale applications by individual roads and repeated tests by the Association of American Railroads, chemical combinations that include "Karmex" or "Telvar" continue to outperform other chemicals and chemical combinations used for weed control.



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Efficiency with safety—Even along track bordering such highly sensitive crops as tobacco, cotton, soybeans, tomatoes and peanuts, you can control brush by spraying with Du Pont AMMATE® weed and brush killer without vapor damage to crops. That's because "Ammate" is non-volatile.

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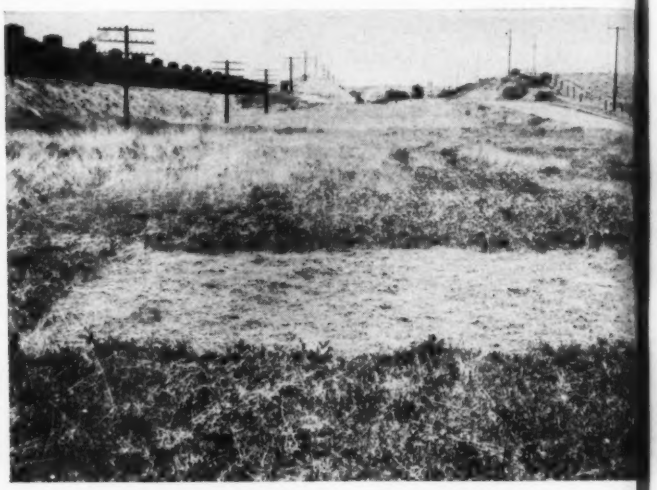

TOUGH PERENNIALS

Bindweed and certain other hard-to-kill weeds—TRYSBEN® 200 weed killer was applied to this test plot over a year ago. Note how thoroughly one application controls bindweed. "Trysben" 200 also gives best control of other deep-rooted perennials such as Canada thistle, leafy spurge, bur ragweed and Russian knapweed . . . also kills a variety of broadleaf weeds, woody vines and certain kinds of brush. It acts faster and more efficiently by attacking through roots and leaves.

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Railway TRACK and STRUCTURES

DECEMBER 1961
Vol. 57, No. 12

B&O undercutting track on big scale

This road has many miles of track that are afflicted with fouled ballast and a centerbound condition. It is felt that further track raises on the old ballast would be ineffective in coping with the situation. Using modern equipment the road has embarked on a program to undercut the track and clean the ballast. The track is then raised 4 in on the reclaimed ballast.

● "Operation undercut." That might well be the designation for an extensive program now underway on the Baltimore & Ohio. The program involves the undercutting of the track and the cleaning of the ballast. At the same time the ties are renewed and respaced. Here is the reasoning behind the program:

On a considerable mileage of B&O track the ballast has become fouled and the track centerbound. Efforts to correct the condition by raising the track on the old ballast and adding new ballast have been a "total failure," according to J. A. Caywood, chief engineer. This statement also applies to the practice of making "skin lifts."

Under the conditions that prevail the results of simple track-surfacing raises are short-lived, says Mr. Caywood. The ties are soon rocking on their centers and "loose" at the ends, requiring an excessive amount of spot-surfacing.

Another aspect of the situation is the fact that repeated track raises have placed the track above the subgrade to the point where further raises will require widening of the shoulders.

In view of these conditions engineering officers of the road have been led to the conclusion that the only satisfactory solution of the problem is to "free up" the entire track section, that is, by applying a generous layer of clean ballast under the ties. To accomplish this end economically without raising the grade means that the track must be undercut and the ballast cleaned and returned to the track for the required raise.

Now uses AREA ballast section

In conjunction with the undercutting program the road is also revamping its ballast section to adapt it to the AREA standard. In the present ballast section on this road the slope begins directly at the ends of the ties. In adapting to the AREA standard the primary change required is to provide a 6-in shoulder outside the ends of the ties.

An important reason for adopting the AREA standard is the fact that the road plans to lay welded rail wherever possible in the future and it is felt the additional stability offered by the wider section is needed. Whenever welded rail is laid it is planned to add sufficient ballast in the cribs to make it come level with the tops of the ties.

In the undercutting operation the aim is to place about 4 in of clean ballast under the ties. In obtaining this objective the track is undercut an average of 6 in and is then raised 4 in on the cleaned ballast. It is estimated that 11 cars of new ballast are required per mile to bring up the ballast section to the new standard.

Another type of work done in conjunction with the undercutting is the renewing and respacing of the ties. Prior to 1955 the standard tie spacing on the B&O called for 24 ties per 39-ft panel. At that time this was changed to 22 per panel, primarily to facilitate the use of production tampers. Therefore, in connection with the undercutting work the ties are, where necessary, being respaced to the new standard.

Use two types of equipment

In carrying out the undercutting and ballast-cleaning work use is being made of two types of equipment. One of these is a team of machines composed of the Kershaw Undercutter and Kershaw Ballast Cleaner working in tandem. The other type of equipment is the single-unit Matisa Ballast Excavating and Cleaning Machine.

During the past summer the Kershaw equipment was seen in operation on the B&O's Buffalo division where it was engaged on a programmed project involving tie renewals, undercutting, ballast cleaning, surfacing and lining on about 60 miles of track.

Equipment in the tie-renewal unit of this operation consisted of a Kershaw Ballast Regulator plowing ballast away from the tie ends; a Fairmont spike puller removing spikes from the ties to come out; a Kershaw Super Jackall raising the track about 2½-in to facilitate removal of the ties; a Fairmont Tie Remover forcing out the old ties; two Kershaw Tie Bed Scarifiers loosening the crib ballast in the old tie beds; a Railway Track-work Tie Handler piling the old ties and setting the new ties in position; a Kershaw Track Crane inserting the new ties; and an RMC Auto-Spiker spiking the new ties. Personnel in this unit consisted of a foreman, two machine operators and 15 laborers.

Immediately behind the tie-renewal operation came the undercutting and cleaning unit. Equipment in this unit included two Kershaw Undercutters working in tandem and cutting the track down 6 in. Each undercutter was followed by an RMC Tie Spacer equalizing the tie spacing. Bringing up the rear was the Kershaw Ballast Cleaner. This

Undercutting track on big scale cont'd

ABOVE—Kershaw Undercutter working on the B&O's Buffalo division. Men in picture are members of AREA Committee on Economics of Railway Labor.

Kershaw equipment in operation

RIGHT—Undercutting operation was followed by the Kershaw Ballast Cleaner which picked up ballast from shoulders, cleaned it and returned it to the track.

unit picked up the ballast from the shoulders where it had been piled by the undercutters, cleaned it and returned it to the track. Personnel in this unit consisted of a foreman, 4 operators and 8 laborers. On occasion it was necessary to operate the ballast cleaner a second trick, in which event a foreman, 2 operators and 2 laborers were added to the organization.

Following the ballast-cleaning operation the track was surfaced and lined by a unit consisting of a Super Jackall working in conjunction with a Nordberg Trak-Surfacer to raise the track 4 in; a Jackson Track Maintainer, a Nordberg Trakliner and a Ballast Regulator dressing and shaping the ballast. In this unit were a foreman, 3 operators and 3 laborers.

In addition to the foregoing units the organization included a utility gang, consisting of a foreman and 6 men, which hauled and distributed material, water and fuel and assisted at the crossings and in doing miscellaneous work. Other personnel on the job included a general foreman, an engineering assistant and 3 mechanics.

During the course of the work on the Buffalo division a total of 48.53 miles of track was undercut and the ballast cleaned in 121 working days, giving an average output of 2117 ft per day. Tie renewals averaged 343 per mile.

An average of 11 cars of ballast was added per mile. Six of these were required to widen the ballast section to the AREA standard, and five were needed to replace unrecovered ballast. An average of 19 cars of ballast per mile was recovered. The reduction in expense by recovering and re-using this ballast is estimated by the road to total $2,342, including $1,767 for the ballast and $575 as the cost of work train service and labor for unloading.

How Matisa machine was used

When the Matisa machine was seen in operation last summer it was working at a point on the B&O's Baltimore-St. Louis main line between Piedmont, W. Va., and Rowlesburg. The machine was working on the so-called "Cranberry Grade" which has a maximum gradient of 2.8 per cent. In this area the ballast had become badly fouled, largely from coal-dust droppings from the heavy coal traffic carried eastbound over the territory.

The work underway here was essentially the same as that being carried out on the Buffalo division. For the most part the Matisa machine was being worked two shifts. The other units, however, were not worked more than one trick, but merely beefed up with additional men and machines to keep up with the double-trick progress of the ballast cleaner.

For one-trick operation of the bal-

last cleaner the tie-renewal unit consisted of a spike puller, a rail lifter, a tie remover, a Tie Bed Scarifier (all Fairmont machines), a Kershaw Track Crane inserting the new ties, and an RMC SpikeMaster driving the spikes. When the ballast cleaner was worked two tricks a spike puller, a tie remover and a SpikeMaster were added to the equipment lineup. For single-trick operation of the ballaster cleaner the tie-renewal unit consisted of 14 men and one foreman; for double-trick operation it consisted of 22 men and a foreman. Tie renewals were being made at the rate of about 400 per mile.

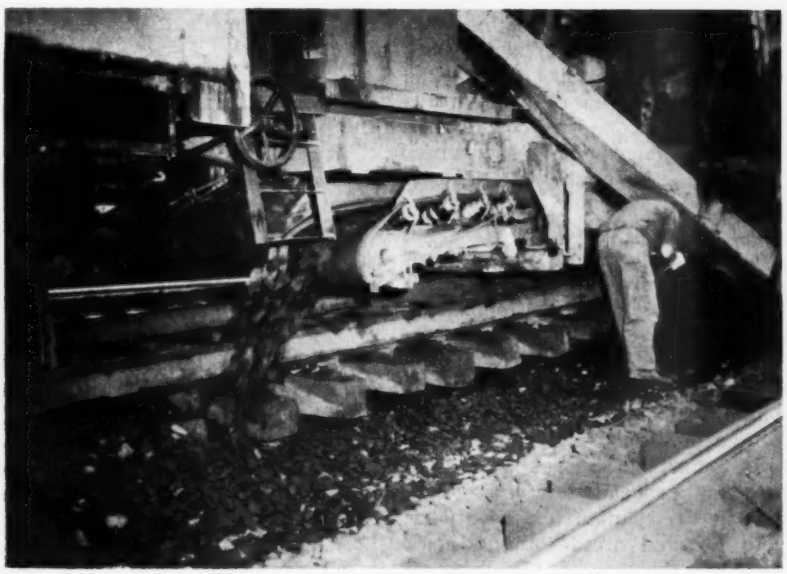
Jack–tie spacer team raises track

Behind the tie-renewal operation, and ahead of the ballast cleaner, the track was being raised 4 in without tamping. For this purpose an equipment team was being used consisting of a Nordberg Power Jack for raising the track and an RMC Tie Spacer for shifting the ties onto the tops of the adjacent cribs to hold the raise. Four men were used with each such team.

Following behind the track-raising unit the Matisa machine undercut the track 6 in to 8 in, picked up and cleaned the ballast and returned it to the track. As the ties came to rest on the subgrade behind the undercutting chain they were adjusted to the present standard spacing by two men working with the machine.

When working two shifts the Matisa machine started the first trick at 5 am and worked until 1:30 pm with a half-hour for lunch. For the second trick it started at 2:30 pm and worked until 11:00 pm. Personnel accompanying the ballast cleaner on the first trick consisted, in addition to the two men spacing ties, of a foreman, a machine operator and a Matisa representative. For the second trick an additional man was added to watch the discharge boom, to do the necessary flagging, and for relief of the other men in the crew.

ABOVE—The Matisa Ballast Excavating and Cleaning Machine working on the B&O's "Cranberry Grade" between Piedmont, W. Va., and Rowlesburg.



LEFT—In connection with operation of Matisa machine the ties were adjusted to the road's standard spacing. Note cleaned ballast returning to track.

The Matisa machine at work

The raising and lining unit, working behind the ballast cleaner, gave the track a 4-in raise. Ahead of this unit the ballast was equalized by a Kershaw Ballast Regulator. The raising was done with aluminum track jacks and the track was tamped with a Jackson Track Maintainer. Personnel consisted of a foreman, a machine operator and five men. Track lining was done by a foreman and two men using an RMC track liner. Later the track was given a smoothing raise of 1½ in.

The undercutting and ballast-cleaning operation involving the Matisa machine was started on March 27. Up until November 1 it had undercut 95.78 miles of track. This was equivalent to 2,229 ft per trick.

A second Matisa machine has now been placed in operation on the B&O, primarily for undercutting track and cleaning ballast in connection with a program to increase clearances.

ELECTRIC DRILLS being used to make borings in arch members of timber sets.

When the untreated timber lining in the C&O's 3600-ft Pine Mountain tunnel started to develop signs of decay several years ago the railroad began to consider possible corrective measures. Renewal of the lining piece-meal over a period of years was one of these. But this measure was rejected in favor of a plan to treat the lining in place at a cost less than one-tenth that of replacement of the entire lining.

Timber tunnel lining

● The Chesapeake & Ohio recently completed a project involving the in-place preservative treatment of about 2700 ft of timber lining in a tunnel. Approximate cost of the work was $50,000. Thereby the railroad feels it has postponed indefinitely the need for renewing the tunnel lining in its entirety, an undertaking that would have involved a total expenditure in the neighborhood of $600,000.

The story begins back in 1947 when the C&O undertook the construction of a 3600-ft single-track tunnel to carry a 10-mile extension of its Big Sandy subdivision through Pine Mountain. The extension, built to serve a coal mine, connected with the subdivision at Jenkins, Ky. Except for a 900-ft length of concrete lining at one end the tunnel is lined throughout with untreated timber.

Main supporting members of the timber lining consist of 809 timber sets spaced 2 ft to 4 ft apart. The sills, posts, plates and ring segments of the sets are all 12-in by 12-in white oak members. The arch rings and about 50 per cent of the wall areas are lagged with 4-in white oak planking.

By 1957 signs of decay began to show up in the timber sets. Shortly thereafter the road began to consider the possibility of taking corrective measures. One of these, of course, was to renew the tunnel lining in its entirety. Consideration was given to the possibility of doing this work over a period of six or eight years, renewing those sets first that showed the greatest amount of decay. It was estimated that the total cost of complete renewal would be somewhere between $500,000 and $700,000.

Before a final decision could be made on renewal an alternative proposal was made. This was to treat the timber lining in place with materials and techniques developed by Osmose Wood Preserving Company of America, Inc., Buffalo, N. Y. The method consists essentially of thoroughly soaking the exposed surfaces of the dry timbers with a five per cent pentachlorophenol-oil solution containing special additives, and injecting the solution under pressure into decayed areas through holes bored for the purpose. Fluor chrome arsenate phenol, Type B preservative is used on the wet timbers.

Before a decision could be made regarding which procedure to adopt a very careful inspection of the tunnel lining was made in which the timber sets were tested for decay by sounding with hammers and by taking increment borings where evidence of decay was found. From this inspection it was concluded that no more than about 10 per cent of the sets were decayed to the point of requiring partial or complete renewal, and that the remainder could probably be left in service for years providing they could be effectively treated to prevent further decay. The decision was made, therefore, to proceed with the Osmose treatment, and the project got underway on July 7, 1961, with Osmose doing the work under contract.

The treatment was carried out by a crew of the contractor that averaged five men. Equipment furnished by the contractor consisted of two spray trucks, a generator and the necessary hose, spray heads and interior treating nozzles. The railroad provided two tunnel cars, a generator and flood lights. The tunnel cars each consisted of a heavy-duty push car on which was mounted a jumbo-type timber frame with working platforms to permit the men to reach all parts of the sets. The railroad also provided a motor car to transport preservative into the tunnel.

A crew of 8 to 10 men was provided by the railroad to perform various incidental jobs in connection with the treating work. These men cleaned away dirt and debris from around the sets ahead of the treating crew, moved the working platforms with a motor car as necessary, and transported equipment and materials for the contractor.

In carrying out the treating work use was made of a printed form designated a "Tunnel Inspection and Treating Report." A feature of the form was a drawing of a typical timber set on which was indicated a standard pattern of borings to be

WORKMAN uses shell-thickness indicator to determine remaining shell thickness of a plumb post.

PRESERVATIVE is applied under pressure to plumb post with internal decay. Note overflow escaping from hole above nozzle.

SPRAY NOZZLE is used to apply preservative to external surfaces of vertical posts and lagging.

treated in place for longer life

made. At every timber connection three holes were drilled in each timber, making a minimum of 42 holes in each complete ring. The form also contained spaces for identifying the set, indicating the condition of the timber at the boring locations, giving details of the treatment and other information.

The procedure when carrying out the treatment was to drill holes at all points indicated on the form. If decay was found additional holes were drilled to ascertain the extent of it. All holes were treated internally with a special nozzle at a pressure of 75 to 100 psi, and then each hole was filled with a treated plug. Next, all exposed parts of the set were treated externally by flowing on the preservative. Where additional pressure was needed the preservative was applied by misting. In addition, holes were drilled through the lagging and preservative flooded on the packing and lagging.

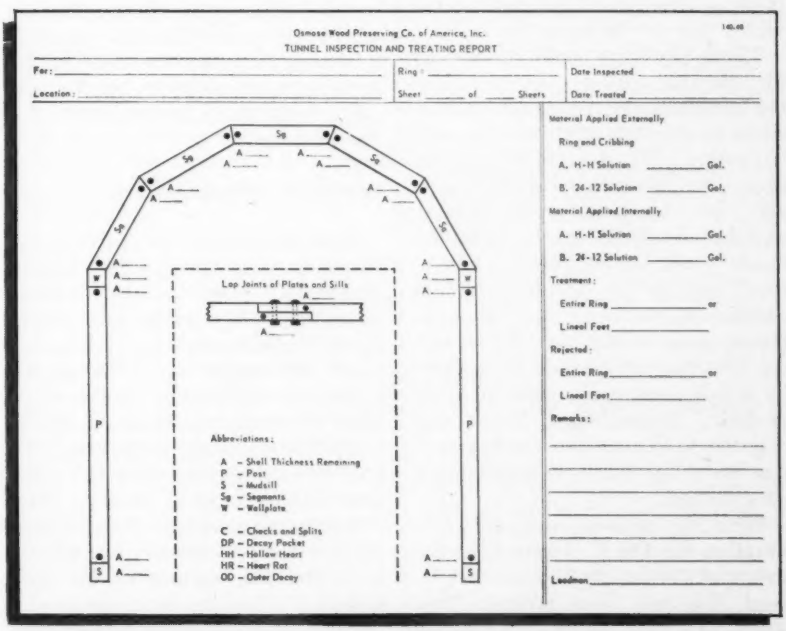
An average of about 14 gal of preservative was applied externally on each set. Preservative applied internally in each set averaged 1½ gal.

During the boring procedure about 80 of the arch rings were encountered in which decay was found to be too far advanced to justify treatment. In this event the ring was rejected for treatment and marked for renewal. Also some of the plumb posts were found to be so badly decayed they had to be posted or replaced. The ring segments which were rejected for treatment and marked for renewal amounted to approximately 10 per cent of the total timbers, while the posts and plates amounted to only about 2 per cent of the total.

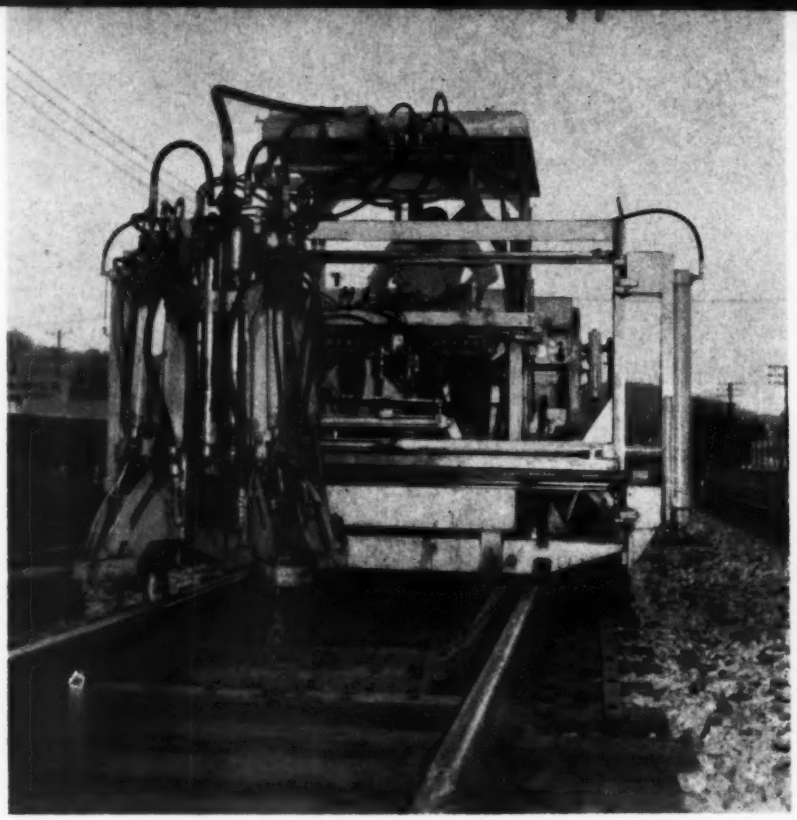
The work of treating the timber sets was completed on October 20. The railroad now has a crew in the tunnel renewing the arch rings and posts that were rejected for treatment.

According to C&O officers, if this in-place treatment proves satisfactory, and it is felt only time will tell, it is expected to prolong the life of the timbers as much as 10 years.

As a result of the work described in this article the railroad now has in its possession a complete record of each timber in the tunnel. In addition to showing the preservative applied it indicates whether the timber was sound, or if it has a punky heart, in which event the thickness of the remaining shell is indicated.


Osmose Wood Preserving Co. of America, Inc.
TUNNEL INSPECTION AND TREATING REPORT
140.60
For:
Location:
Ring:
Sheet ____ of ____ Sheets
Date Inspected
Date Treated
Material Applied Externally
Ring and Cribbing
A. H-H Solution ____ Gal.
B. 24-12 Solution ____ Gal.
Material Applied Internally
A. H-H Solution ____ Gal.
B. 24-12 Solution ____ Gal.
Treatment:
Entire Ring ____ or
Lineal Feet ____
Rejected:
Entire Ring ____ or
Lineal Feet ____
Remarks:
Leadman ____
Lap Joints of Plates and Sills
Abbreviations:
A – Shell Thickness Remaining
P – Post
S – Mudsill
Sg – Segments
W – Wallplate
C – Checks and Splits
DP – Decay Pocket
HH – Hollow Heart
HR – Heart Rot
OD – Outer Decay

INFORMATION giving results of the inspection of each timber set in the tunnel, and details of the treatment applied, was indicated on this form.



THE SPOT TAMPER has four heavy-duty tamping guns mounted on a traversing tamping head. Here it is shown working at a switch.

The Pittsburgh & Lake Erie is predominantly a terminal railroad with an unusually large number of switches per mile of track. Its out-of-face surfacing operations were mechanized some time ago but the work of tamping turnouts continued to be done with hand-held guns or forks. Result: Switch maintenance lagged. This condition is now being corrected with the help of a McWilliams spot tamper which was placed in service in March of this year.

On the P&LE . . .

Spot tamper upgrades s

● "I believe we have more switches per mile of track than any other railroad," said E. G. Brisbin, chief engineer of the Pittsburgh & Lake Erie. "We maintain 342 miles of main-line tracks and 446 miles of yard and switching tracks for 788 miles of tracks of all types. In this trackage there are 2,743 switches, of which 446 are in main tracks."

These statistics were recited by Mr. Brisbin during a discussion of the problems this road has encountered in maintaining tracks through turnouts. "Track-surfacing operations were mechanized several years ago, but tamping work through switches continued to be done by hand. Since we didn't have equipment capable of tamping through switches as we went along the surfacing gang would skip them with the idea that they would be tamped by a follow-up gang using air guns or forks," he explained. Result was that the road was not keeping current with the work of maintaining its switches.

With the goal of correcting this situation the P&LE obtained, in the spring of 1961, a McWilliams single-head, four-tool spot tamper. This unit is of a type (see accompanying description) that has special features designed to enhance its ability to tamp through switches. Experience on the P&LE is that the spot tamper will tamp practically any place in a switch that can be reached by hand-held guns. Officers of the road say it will tamp 95 per cent of a No. 16 turnout.

Works in surfacing gang

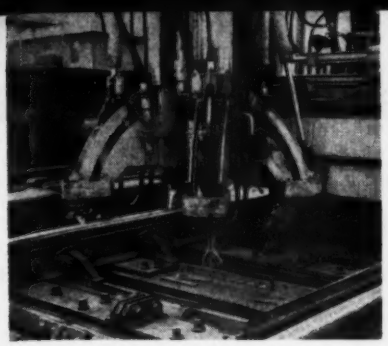
First assignment of the spot tamper was to tamp through the switches as part of a gang that was engaged in a project to surface both tracks of the double-track main line between Pittsburgh and McKeesport, a distance of 15 miles. In this operation the work was done on "dead" track. The surfacing gang, using two production tampers, gave the track a smoothing raise of ½ in to 1 in. This gang skipped over the switches, but these were tamped immediately behind the tampers by the spot tamper.

The organization used with the spot tamper consisted of a foreman, an operator and two laborers. The foreman sighted the track by eye and the laborers forked in ballast to the tamper and also handled the hand jacks when they were used to raise the track. When the ballast was cemented or where the jacking was heavy for other reasons the integral hydraulic jacking cylinders on the machine were used to raise the track.

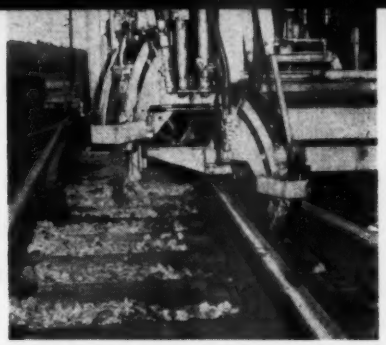
This project was started in March and was finished in May. During this period the spot tamper tamped about 90 switches. Its output averaged nearly three switches per day.

Next job: Interlockings

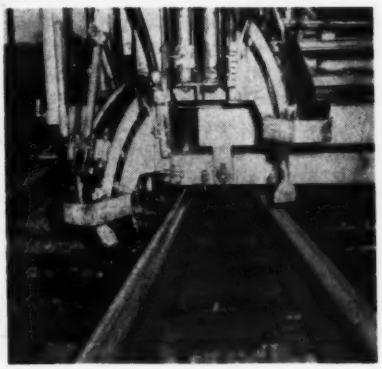
Next the spot tamper was put to work tamping turnouts at interlockings. In this work it was necessary for the machine to construct run-offs at switches that were tamped and also to spot surface between turnouts in the interlocking. Where possible traffic was rerouted to avoid interference with the work of the spot tamper, but even so it was frequently necessary for the machine to clear

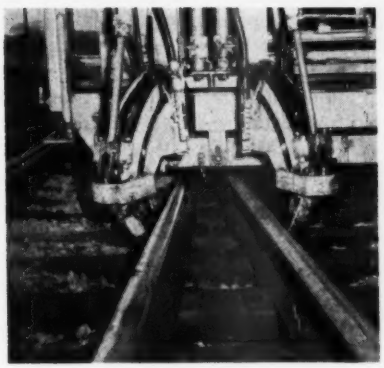


TAMPING HEAD (above) in working position at power-operated switch. Below the machine is tamping with one pair of guns while the other is raised.



ONE PAIR of guns (above) tamps in angle of toe of frog while the other remains in raised position. Below all four guns are working as head straddles frog.





IMPACT WRENCH, using air from spot tamper, is used to tighten bolts in joint at switch, also for the same purpose when spotting in open track.

es switch maintenance

the track for train movements. As a result the average on-track time when working in interlockings was only 4½ hr per day. Average production was about one No. 10 turnout per day, plus run-offs and spotting of track between the switches tamped. During the time it was engaged on this assignment the machine tamped all or part of the switches at five interlockings.

The spot tamper is assigned by the chief engineer's office to, and rotated among, the road's four track supervisors on an as-needed basis. Each day's work is planned by the supervisor on the basis of his knowledge of track conditions, following personal inspections by train, motor car and walking, together with reports made by two-man Inspection and Repair gangs of conditions needing correction.

How about the quality of the work done by the spot tamper? "With this machine," says Mr. Brisbin, "we get a more uniform lift and a more uniform tamping job than when we used hand-held guns or forks. We're getting better riding track and it's standing up longer."

Officers of the P&LE have come to regard the spot tamper as a versatile tool capable of doing a variety of tamping jobs. "We have found the machine to be versatile in various ways," says Mr. Brisbin. "The longer we have it the more we learn about what it will do."

In addition to tamping through switches when making out-of-face smoothing raises, the machine will also be used for the same purpose when 3-in raises are made in connection with cycle tie renewals. During the winter months it is planned to keep the machine busy by having it do spotting work on yard tracks and by tamping through yard leads. P&LE officers figure they can get by with the one machine by working it about eleven months out of the year. Later on when the switches in Gateway yard (opened in 1958) begin to need attention they feel another spot tamper will be needed.

Features of Spot Tamper

Manufactured by Railway Maintenance Corporation the McWilliams spot tamper has four heavy-duty air tamping guns mounted on a traversing head, permitting the head to be positioned over either rail. The tamping head is of the split type with separate hydraulic controls for raising and lowering the guns in pairs inboard and outboard of the rail. Lift cylinders of the guns are air-operated and are controlled individually, applying a down pressure of 450 lb on top of each of the tamping guns. The guns may be operated as a group, in pairs or individually. Each gun is said to deliver blows with an impact of 11 ft-lb at a frequency of 1,375 cycles per minute.

Other features of the tamper include indexing of the tamping head, hydraulic jacking cylinders and rail clamps, integral cross-level indicator, four-wheel drive, four-wheel air brakes with emergency reservoir, hydraulic centerlift with turntable, and hydraulic propulsion through three-speed transmission delivering travel speeds of 6, 12 and 24 mph.

The machine is equipped with a special Ingersoll-Rand 125-cfm rotary air compressor powered by a Model 3-53 General Motors diesel engine. The unit has a 2000 psi hydraulic system with normal operating pressures of 1800 psi. A Vickers multiple-bank valve controls the system. The 16-in heavy-duty wheels are driven by a Denison hydraulic propelling motor.

Since a spot tamper is normally required to make a minimum lift (from 0 to 1 in) the manufacturer points out that the heart of the machine is the special heavy-duty tamping tool used. This tool, it is said, is especially constructed to withstand the high down pressure created by the cylinders of the machine, compared with that exerted by a laborer using the same tamping tool as a hand-held unit.

Conference discusses

- **Properties of invert emulsions**
- **Effectiveness of dormant sprays**
- **What to do about resistant species**

THE USE of helicopters for spraying herbicides, especially invert emulsions, was mentioned at the conference.

By **Rockwell Smith**

Research Engineer Roadway
Association of American Railroads

● The third Association of American Railroads vegetation control conference was held in Roanoke, Va., on September 27-28, 1961, under the joint sponsorship of Virginia Polytechnic Institute. The program consisted of a field trip to inspect test plots and commercial applications both on railroads and utility rights of way on September 27 and a seminar-type conference on September 28.

During 1960 the Research Department, AAR, through a grant to Virginia Polytechnic Institute, Blacksburg, Va., helped support a research study into methods for the control of vegetation by means of chemicals. This project was under the direction of Dr. W. E. Chappell, professor of plant physiology of the institute, and was planned for a minimum of three years. Lack of budgeted funds prevented the continuation of the research during 1961. Dr. Chappell, however, had reported on several promising new developments derived from the 1960 AAR work and other investigations for utilities. This was one of the prime factors in locating the conference at Roanoke.

The registration list consisted of 55 persons, including personnel from 18 railroads, various chemical companies, contractors and applicators, including firms that specialize in off-track equipment and have done work on railroads in rather inaccessible territory. The conference was planned locally by Prof. Chappell with assistance from Walter Clark of the Norfolk & Western. Brush-control work was emphasized, but roadbed control was also inspected and discussed.

The groups set out from Roanoke on the morning of September 27 by bus for an inspection of test plots on the N&W, including work on the old Virginian. Inspected were the communication and power lines over several tunnels. Control of brush on these areas was a problem for off-track equipment and also a problem in accessibility for any equipment. In one area several thousand feet of hose needed to be dragged up the mountain. Conventional 2,4-D and 2,4,5-T solutions were used on foliage sprays. Results were excellent and, for the three or four years control received, costs were reasonable. The N&W has 30 or more tunnels which have been or will be treated in this manner.

Test control plots placed by VPI personnel consisted of both foliage sprays and dormant sprays. The dormant sprays were usually of cane broadcast and soil type during which the root area for a radius of two or three feet around the stem of the plant is also treated. Apparently this method controlled ground vegetation to some extent and appears to have reduced the resprouting of the suckering species.

Also inspected were on-track applications on the roadbed section with dry materials, including several new products whereby direct comparison could be obtained from the effectiveness of such materials as well as results from differing rates of the same material. With additional check plots to indicate vegetation not affected by chemicals, it was apparent that a minimum rate could be established below which no full value for the expense of application could be obtained. This point also was brought out in the conference on the following day.

During the inspection the group was privileged to see applications of both dry and liquid materials from a powered knapsack sprayer. This apparatus is being developed at several sources and gives promise of value for spot treatments for both weeds and brush where problems have arisen through control of the more susceptible species and the infestation of deep-rooted perennials which are resistant to ordinary control methods.

Tests with invert emulsions

The research group at VPI has experimented rather extensively in the last few years on the use of invert emulsions of D and T. These emulsions, water in oil, are the reverse of the emulsions for standard D and T treatments and require a much less volume of water. The consistency from the spray nozzles is that of soft mayonnaise. It is as yet strictly a foliage spray, but the droplets are large and are said to spread over the leaf so that complete coverage is not necessary as is usual in the conventional foliage sprays.

This material with its large drops is not nearly as susceptible to drift as the other materials and can be, in general, much more safe for use in agricultural areas. It has been used extensively by utilities in the Virginia area for helicopter sprays with fair to excellent results and appears to be of value for control of regrowth at a comparatively low cost. From the area inspected along the railroad receiving this spray it was also indicated that the inverts might be of value in controlling the root suckering species, such as sumac, locust, sassafras, etc.

Time did not permit inspection of

developments in vegetation control

- **Application of herbicides by helicopter**
- **The problem of restricted budgets**
- **The growing need for spot treatments**

plot areas containing TBA (trichlorobenzoic acid) and ATA (aminotriazole). Previous inspections, however, have indicated that these materials can also be of value on a number of brush species and also on perennial weeds as a selective or spot treatment.

Dormant sprays discussed

Discussion at the conference on September 28 took place under three main headings. The first dealt with the general problems facing the industry in vegetation control. The meeting was opened by Dr. Chappell, who acted as discussion leader. Dr. Chappell brought out the possible beneficial effects of dormant sprays in which the lower third of the stems are covered, together with the ground around the base of the stem.

The dormant sprays are mixed with oil instead of water—about 100 gal per gallon of chemical and he reported that they result in almost 100 per cent top kill. There was, however, very appreciable resprouting of certain species and in some cases where the main stem was killed the resprouting resulted in an increase of growth of 50 to 100 per cent. This, however, is not limited to the dormant sprays, but is as fully apparent in the foliage sprays if not more so. It is for these types of species that TBA and ATA may be effective, but based on limited research they appear more favorable when used in foliage sprays. Dr. Chappell reported that, in general, without special additives dormant sprays are equal to or slightly more effective than foliage sprays; in treating oaks, red maple and pine the dormant treatments are usually more effective.

The value of dormant spray is apparent in areas where agricultural damage is possible or where foliage sprays with D and T require special regulation. The cost of using oil increases the general overall price slightly, but it is possible that the greater effectiveness of this type of treatment may compensate for this increase.

D. H. Yazell of the Illinois Central handled the subject from the railroad standpoint. Mr. Yazell showed pictures of dormant spray work on his road and also views of new equipment for brush-control work. The purpose of the new brush spray equipment is to give better coverage of foliage applications and its main difference from spray outfits now in use is that the chemical-water mixture is blown out from in front of a powerful fan with speeds estimated at 100 mph. This is designed to penetrate foliage better and give coverage of back growth as well as that nearest the track.

Handling resistant species

According to Mr. Yazell one of the problems facing control of vegetation is the elimination of the more resistant species which he reports are fairly well controlled by dormant sprays for oaks and red maple, but which are not fully effective on the vegetation which sprouts from the roots. It was his opinion that special treatment for these growths would eventually be required after the elimination of other species controlled by usual methods. It is here that invert emulsions or soil sterilants may be of value.

Continuing the discussion of the problems facing the railroads and chemical industry, Dr. Chappell called on Roy Johnson of Amchem Products, Inc., for his analysis. Mr. Johnson stated that from his company's standpoint the problem for railroads is a continuing one of developing new products, improving present materials and serving the railroads technically as far as possible.

T. O. Evrard of Diamond Alkali Company seconded Mr. Johnson's remarks and added that continuing research was very definitely needed to investigate further the optimum rates, time of application and the study of vegetation so that the present and the to-be-developed herbicides can be specified rationally.

L. A. Conn of Du Pont emphasized the importance of research and a study of the problem prior to specifying treatment. As an example, Mr. Conn mentioned ammate as a herbicide for use in the presence of conifers in brush problems, while not limiting its value for this use only. Ammate is generally safe for use during the growing season because of its lack of drift and its all-around effectiveness which compares with the hormone types of brush-control chemicals. His main emphasis was on the need for analysis of the problem and in this way the manufacturers could assist the railroads more effectively.

H. R. Schneider of General Chemical emphasized the need for products for treatment of resistant or resprouting species, both brush and weeds. As a possibility for control he suggested additional applications of dry materials and continuing research into species, rates and term of control. Mr. Schneider mentioned that repeated annual applications on the railroads have resulted usually in good control, but this has reduced competition and allowed the more resistant species to take hold. For these special treatments must be devised and it is in this field that the dry materials appear to be of value.

T. L. Bendall of Dow Chemical Company said that his company was continuing its extensive program of field research for screening materials.

The four participants mentioned above were representatives of manufacturers and applicators, or both. For the applicators alone, C. L. Gregson of the F. A. Bartlett Tree Expert Company gave his version of the problems. Mr. Gregson's firm deals mainly in application of chemicals by the use of ground equipment and has carried out a number of projects for the N&W over its tunnels. He noted that many projects do not yield the desired results because of poor coverage either through insufficient chemicals or careless ap-

plication, or both. He stated that his company was of the opinion that most problems in control could be satisfactorily handled by careful observation of essentials. Among these are the time of spray, the type of material used, the rates, the species involved and the care taken in the application.

H. Brown of the Campbell Air Service discussed applications through the use of helicopters. He described a revolving disk by which the material is sprayed onto the brush from heights of 10 to 40 ft. The revolving disk is fed by two tanks on the sides of the fuselage and the width of spray is controlled by the speed of the disk. It is so calibrated that by speeding up the rotation additional material is fed automatically into the disk nozzle.

The invert emulsions are well adapted for helicopter spraying. Little drift is experienced with this type of material because of its rather viscous nature, plus the fact that the main draft from the helicopter is downward. Also, the limited capacity for weight carrying necessitates the use of low volume material. The invert emulsions can be sprayed at low total volume with equal content, compared to conventional sprays, of basic acid of the hormone variety. He also noted that the droplets falling on the leaf tend to spread out, and that this, in effect, gives the same coverage as a complete drenching with water-borne sprays.

These talks were followed by discussion from the floor with Dr. Chappell as moderator. A point that brought forth considerable discussion was the tendency of some railroads to hold their applications to a minimum, either because of budget restrictions or in an effort to increase the mileage treated. It was the consensus that this is poor practice. Agreement was general that it would be better to apply additional dosage on the portions treated and leave the rest for later application.

Following lunch, the conference took up the second general subject —Formulations and application problems with on-track equipment. Leading this discussion with short talks were J. B. Bogle of the R. H. Bogle Company, W. A. Stearman, Chipman Chemicals Limited, and I. Minsky, Reade Manufacturing Company. All of them emphasized the necessity for a planned program and the use of additional dosages as required for any special problem in hand. Regarding formulation problems, they were largely of the opinion that it is impractical to formulate a track spray application to encompass, at acceptable costs, all types of vegetation present. As an example, annual and perennial grass will react differently than broad-leaf weeds and often the annual variety will react differently than the perennial species. However, it is possible to formulate for both broad-leaf annual weeds and grass to a certain extent, particularly the annual varieties.

In general, however, the problems, insofar as railroad track is concerned, can be separated into the predominant types of vegetation, such as in the coastal plains of Virginia where grass is often predominant. However, here there is present both Bermuda and nut grass and these are severe problems in themselves at rates that appear possible economically. This is one of the main problems now facing the formulators; it also goes back to the question of additional needed research.

Problem of resistant weeds

The infestation of perennial weeds resistant to normal dosages is also a problem facing applicators and formulators. This is becoming worse yearly and will probably resolve itself into required spot treatments. On spot treatments higher dosages over limited areas can be easily justified, but it appears that railroads, in addition to their one or two annual applications, as is the practice now, will need to do some third applications. For this work, application by work train is probably not necessary with development of new equipment that can be handled by maintenance forces. Soil sterilant and dry chemicals specific for the vegetation encountered can be very useful for this purpose.

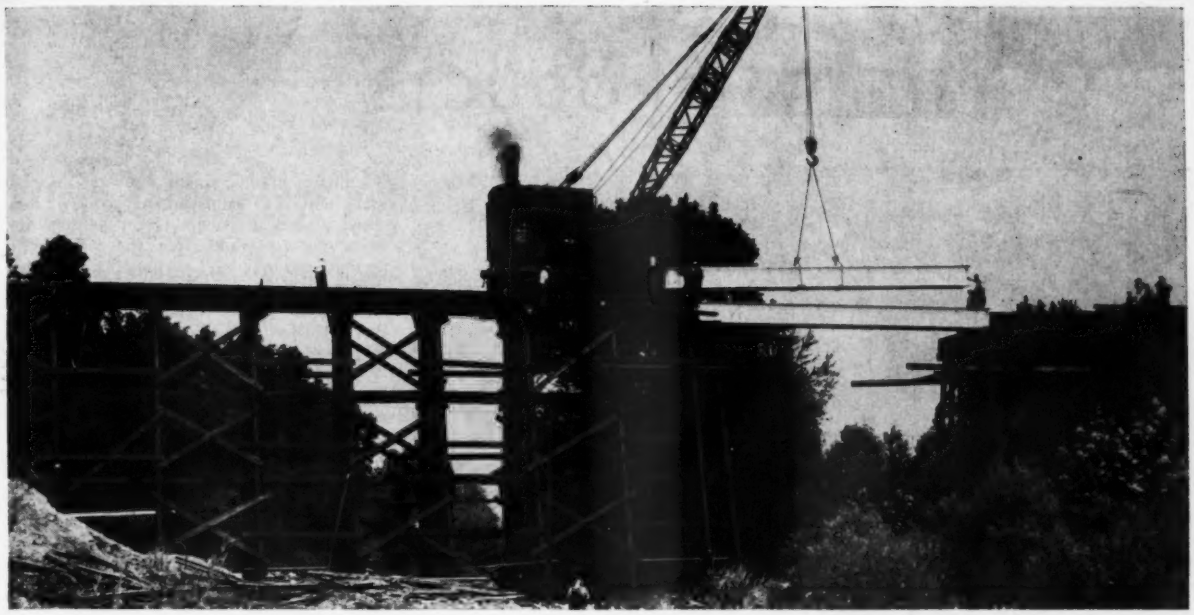
Current practices and results in railroad vegetation control comprised the final subject discussed. The author served as moderator of this discussion. The first speaker was Walter Clark of the N&W who outlined the practices on his road. Mr. Clark noted that the N&W has experienced very good results on brush-control work on track with a yearly application of the hormone sprays where needed, and that, through a contractor using on-ground equipment, very good results were obtained over their tunnels on foliage applications. He estimated that control in many areas was good for three or four years before re-treatment.

Experience on Southern

C. E. Webb of the Southern spoke of his experience with herbicidal oils. He mentioned that full control was not obtained, but that sufficient reduction in stands appeared so that in lieu of other treatments at present the situation was acceptable. In areas on his road two or three treatments per year were required. Other chemicals were used to control special conditions required, such as road crossings where visibility is desired.

Tom Nohejl of the Nalco Chemical Company spoke on the country-wide problem of vegetation control. As other speakers had done previously he emphasized the need to correlate the treatment to the conditions encountered. He also mentioned the need for particular applications for certain infestations of perennial weeds which resist typical annual applications.

Considerable discussion took place from the floor and a number of subjects were brought up in connection with vegetation control. One of these had to do with the disking of the ballast section, which can prove valuable in the prevention of side encroachment. A number of railroads are doing this as well as supplementing their chemical control with mowing with on-track machines. Mr. Nohejl was questioned concerning stump treatment where brush had been cut and it was proposed to treat chemically the stumps to prevent sprouting. At one time, he reported, it was the opinion that it was necessary to treat these stumps for good results within a short period after cutting, but that in his experience these could be treated with equal results any time up to the next growing season. A number of comments from the floor supported him.



Nickel Plate rebuilds long trestle fast

When fire destroyed the 340-ft long, 50-ft high timber trestle over Richland creek, near Mode, Ill., on its main line to St. Louis, Mo., the Nickel Plate "pulled out all the stops" to rebuild the trestle in just 22 days. The fire, which started a short time after 11 pm, was discovered by an Ozark Air Line's pilot who "buzzed" the road's interlocking tower at Mode to attract the operator's attention. When the operator rushed out to see what was happening he saw the flames down the track. Less than three hours after it started the fire had completely destroyed the trestle.

To return the bridge to service as soon as possible, the road hired a Chicago contractor to augment its own forces at the site, which included 5 bridge crews and 2 section gangs. In addition, it was decided to span the channel of the creek with 48-ft steel beams. This decision was made due to the pile-driving difficulties imposed by the presence of tons of riprap which had been placed on the banks of the creek. The steel span was placed on double bents which were anchored to the ground by concrete poured around the base. Reconstruction work started on the second day after the fire, with three crews and a pile driver working from each end. A total of 150 piles, 60 to 65 ft long, were driven to a penetration of 15 to 25 ft.

News briefs in pictures . . .

Jeep doubles as on-track snow plow

These views, taken in upper New York state, show how a pick-up truck can be adapted for use as a snow plow. The vehicle is a four-wheel-drive Jeep equipped with a W. T. Cox Railroad Conversion Unit to enable it to travel on rails. For use as a snow-fighting machine, the Jeep is fitted with an 8-ft snow plow.

The supervisor using the unit shown at the left reports he was able to complete almost one mile of plowing per hour through wet snow which measured 16 in above the top of rail at the time the work started. Another job performed by this pick-up is to apply chemicals at crossings, station grounds and through switches by means of a special chemical-spreading device developed by D. J. Trunzo, Geneva, N. Y.

PRODUCTS

Hydraulic operation for . . .

New spike puller

DESIGNED to pull spikes from both rails with one gun, the new Nordberg one-man-operated "CHP" hydraulic spike puller utilizes a traversing carriage to enable the work to be performed without lifting the gun. To further facilitate handling the pulling gun it is connected to the carriage by means of a pivoting, telescoping mount. To move the gun from one rail to the other the operator slides the traversing carriage along the frame.

The pulling gun is equipped with griping-type pulling claws that are designed to pull spikes of any size or condition. The jaws can be easily and economically replaced, it is claimed. A lever is provided on the handle bar for controlling the operating valve. The Model CHP is powered by an air-cooled engine that is directly coupled to the hydraulic pump. This eliminates the need for belts or sheaves. The unit also is equipped with rubber-tired wheels at one end of the frame for removing the unit from the track. The manufacturer points out that this unit may be used to supply hydraulic power for operating the Nordberg Switchliner assembly. *Nordberg Manufacturing Company, Dept. RTS, Milwaukee, Wis.*

(Circle 200 on TIME-SAVER card, page 41)

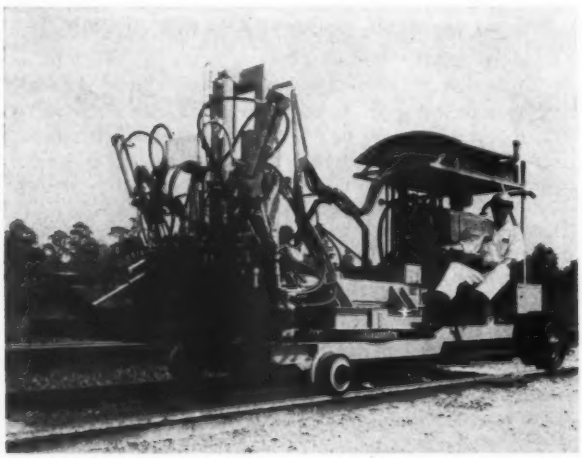
●

Hold spikes upright with . . .

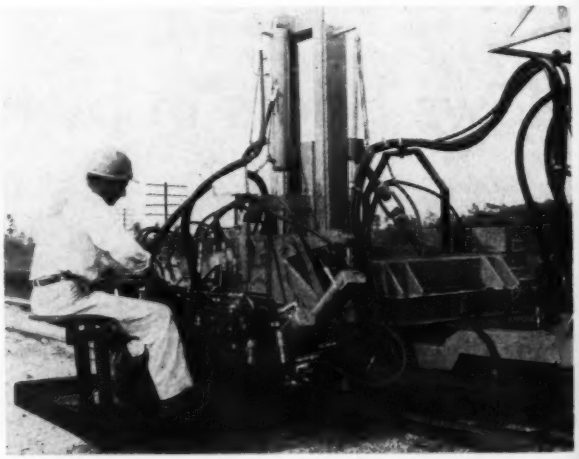
New compound

"STARTING" of track spikes by hand is claimed to be eliminated by the use of a new spike-holding compound. Known as Spike-Set, the material is composed of a loose aggregate which is melted to a viscous liquid in a gas-fired pot prior to use. The manufacturer states that when the ends of the spikes are dipped into the liquid the spikes will remain upright and firmly in place in tie plates for the driving operation. Spike-Set is furnished in fibre drums. *DeSoto Chemical Coatings, Inc., Dept. RTS, Chicago.*

(Circle 201 on TIME-SAVER card, page 41)



MOCWELL In-Track Doweler is a one-man-operated machine.



WORKING HEAD of unit operates from a transverse position.

New Machine . . .

Dowels ties in track

TIES can be doweled in track with the use of a new one-man-operated machine. Known as the Mocwell Model 210 In-Track Doweler, the machine compresses the tie with sufficient pressure to close all splits and checks, drills two holes simultaneously, and inserts and presses into the tie one dowel in each hole.

The Model 210 is a self-contained machine consisting of two carriages, one mounted on the other. The main carriage operates on four flanged wheels and has mounted on it the engine, a seat and controls for the operator when traveling along the track from one job to another. Also mounted on the main carriage is a second carriage which is equipped with the doweling mechanism, including a seat for the operator when the machine is doweling ties. The second carriage is mounted on a turntable located at the forward end of the main carriage to enable the operator to position the working head over both ends of a tie and also over skewed ties. To dowel a tie the working head is positioned transversely of the track over one end of the tie and lowered until the head is directly above the tie.

The doweling operation is performed by two vice clamps which compress the tie and two dowel-pin ram heads which insert the dowels and drive them into the tie. The operator controls the functions of the machine by means of numbered valves located on a control board. The new machine is reported to operate at a minimum rate of one complete tie or one end each of two separate ties in five minutes. *Mock Welding & Machine Works, Dept. RTS, Jacksonville 4, Fla.*

(Circle 202 on TIME-SAVER card, page 41)

WHAT'S THE ANSWER?

When raising low joints

When picking up joints and smoothing track, is it good practice to raise a joint higher than the remainder of the rail? Why? If so, how much higher?

Gives result of tests

By W. B. Blix
Vice President
Railway Equipment Division
Nordberg Manufacturing Company
Milwaukee, Wis.

Perhaps tests we have made with our Midget Surfacer would prove interesting, particularly since these tests are easy for any one to repeat and might prove helpful to any railroad desiring to set standards as to surfacing procedures under particular conditions.

In a stretch of test track with similar conditions of ballast, ties and rail we selected 200 joints that required correction as we came to them with the surfacing equipment. We numbered them consecutively by a painted number on the rail web adjacent to the joint.

The first 50 joints we brought to a zero pointer reading. This would be no "over raise." The next 50 joints we raised one mark (⅛ in) high; the next 50, two marks (¼ in) high and the last 50, three marks (⅜ in) high.

After a day of traffic we recorded the pointer reading at all of these joints, using the Midget Surfacer as a "surface analyzer." Then we came back a week later and made a similar check.

Generally speaking, in rail that was five years old or less we did not seem to get enough settlement to justify "over raising." Furthermore, we found very slight settlement between the readings taken after the first day of traffic and the readings taken after a week of traffic. However, the older the rail the more settlement we seemed to get. Also, this seemed to be true regardless of other track conditions. Stone ballast, whether dirty or clean, gave us less settlement after traffic than lighter ballasts, such as gravel, or chats, but this was true only in older rail. In rail over five years of age the average settlement, after a week of traffic, was slightly more than ⅛ in. Because of this it was our opinion that a ⅜-in "over raise" seemed too much and whether you should "over raise" ¼ in, ⅛ in or nothing at all depended on rail and ballast conditions.

We recorded the amount of "lowness" of the joints before correction and our tests seemed to indicate that the amount of original "lowness" is not necessarily the best measure to use in considering how much to "over raise." We believe that we obtained the best result by what might be called "quality top" by a combination of eye sighting and sighting with the wire of the Midget Surfacer. In this procedure a foreman eye-sighted the rail head and when he found a joint having a pronounced downward kink he made a designating mark on a tie adjacent to such a joint. Perhaps a joint with such a characteristic surface appearance might be considered to be surface bent. Then, as we corrected surface using the Midget Surfacer to locate low joints, the joints marked by the foreman were raised ¼ in high and any other joints requiring correction, but which were not

Also discussed in this section

How to grind manganese frogs . . . 35
Inspecting trestles 36
Transposing rail on curves 39
Prestressed concrete piles 44

NEW QUESTIONS to be answered in March

Do you have an answer to any of the questions listed below? If so, send it in. Payment—based upon substance and length—will be made for each published answer. If you wish your name withheld, we'll gladly comply.

DEADLINE: January 31, 1962

- 1. When requisitioning material for a rail-relay job, should track spikes be ordered for 25%, 50%, 75% or 100% renewal? What is the reasoning behind this percentage? Explain.

- 2. Which is preferable: To endeavor to control rail expansion by the installation of sliding-joint rails on timber-trestle approaches to a steel swing span, or to apply more rail anchors to the rails on the embankment approaches? Explain.

- 3. How often should the overload release on power wrenches be checked and adjusted? Explain. Who should make this adjustment?

- 4. Masonry crews generally have to leave a job before they can effect proper curing of concrete work. Under such circumstances, how can proper concrete curing be effected? Explain.

- 5. To what extent, if any, has the use of continuous welded rail reduced spotting and smoothing work? Surfacing work? Explain.

Send answers to:

What's the Answer Editor
Railway Track & Structures
79 West Monroe Street
Chicago 3, Illinois

Do you have a question you'd like to have answered in these columns? If so, please send it in.

marked by the foreman, were over raised only ⅛ in. Again, the frequency with which such marked joints occurred seemed to increase with age of the rail.

Our tests also seemed to prove that in spot surfacing you have to be careful not to tamp too many ties. If you do, you are apt to wind up, after traffic, with a "hard" or "high" spot over the ties that were at the ends of the original low spot. Because of this, we think it a good rule to tamp two less ties (one at each end of the spot) than looseness of the tie plates, after jacking, would indicate should be tamped.

Depends on several factors

By M. McClendon
Roadmaster
St. Louis-San Francisco
Tulsa, Okla.

It is good practice to raise joints somewhat higher than the balance of the rails when joints only are being raised. This would not apply when several rail lengths are involved. In cases of this kind all trackage involved should receive the proper amount of raise in order to produce a smooth and level-riding track.

In the "jointing-up" operation several factors must be considered in deciding just how much additional raise joints should be given. These factors are:

(a) Cause and effect
(b) Methods and machines to be used in the raising operation
(c) Are joint bars loose or worn?
(d) Are drainage conditions poor and ballast foul?
(e) Are joint ties mechanically worn?
(f) Are rail ends battered?

In each of the foregoing cases the exact extent should be determined.

Where riding condition of trackage is involved, you can readily see that speed would be a prime factor and would tend to shorten the life span of a project of this kind.

The method of tamping and machines used also would have to be heavily considered since ballast would play an important part in the overall operation.

Due to the conditions and circumstances involved in a project of this kind it would be impractical to set exact standards.

While I have attempted to furnish you with information that I think would be involved in the situation outlined it is a problem that would, no doubt, depend greatly upon the condition, location and type of operation involved.

Raise level

By J. H. Becker
Section Foreman (Ret.)
St. Louis-San Francisco
Festus, Mo.

I do not see any need for raising joints higher than the rest of the track during smoothing operations because you may have joints that will not hammer down. This condition would cause bad-riding track. It is hard to tell whether a joint is going to settle since that depends on the roadbed. I would say the best way to smooth your track is to raise all joints level and if you are familiar enough with the track you might tamp the troublesome joints a little harder than the rest of the track. A lot depends on how well you know your track.

I have seen joints that were tamped so solid that they would cause the joint to stick up. This is what we used to call snake-head joints. When you have joints of this kind you can never surface that track to look or ride good since it seems to put too much strain on the angle bars and results in surface bent rail. When this condition exists you can never get the track to ride good. I suggest that when smoothing track the joints should be raised level even if it is necessary to go back in a short time to pick up the low joints. By following this practice you will have much better riding track.

Not today

By Thor Monrod
Section Foreman (Ret.)
Northern Pacific
Billings, Mont.

Some years ago, before mechanization of tamping equipment and improvement of rail joint bars and ballast, it was considered good practice to raise joints higher than the remainder of the rail when smoothing track. The reason for this practice was the knowledge that the joint would settle into the ballast much faster than the remainder of the rail under the impact of the wheels of trains passing over it. When this happened it was necessary to raise the joint again. By raising the joint higher than the balance of the rail it would not be necessary to do this job as often. Therefore, this practice was more or less an economy measure.

This work takes a very experienced track man since it is necessary for him to observe a number of factors, such as the condition of rails, joints and ballast. Also, he would have to consider the type of ballast involved, such as cinders, pit run gravel, crushed rock, slag, etc., and whether or not it was fouled. All of these conditions would have to be considered to determine the proper amount of raise he should give these joints to provide for the proper amount of settlement. There can be no set rule or standard as to the height a joint should be raised above the remaining part of rail. Therefore, this decision must be left up to the judgment of the man supervising the actual raising.

The mechanized tamping equipment of the present day enables ballast to be placed more solidly or compactly under joints than was previously possible. Also, most track now has a better type of ballast, such as crushed rock, slag or similar type, which can absorb more impact of the joint. The advent of stronger and better joint bars, such as 36 in or longer with 6 holes, and heavier rail sections all combine to help diminish the vibration and traffic pressure at joints. All of these factors have reduced the amount of raising or cocking of rail joints necessary, but care must be taken when it is necessary to resort to this practice.

My practice and observation is not to raise or cock any other joints than those that show battered or chipped rail ends, or are pumping. In curves I would not raise any joint on the high, or outside, rail any higher than the remaining part of the rail. However, I would make exception of the joints on the low, or inside, rail providing they are battered or chipped, or are pumping. Curves are more important to maintain than tangent track hence the greater precaution. I would not raise joints any higher than the remaining rail, except for badly churning or battered rail ends which I would raise ¼ to ½ in, but not exceeding ½ in.

How to grind manganese frogs

Despite the rule-of-thumb that "more grinding and less welding" should be done in the care of manganese frogs, improper grinding can be injurious. What is the proper procedure to be used when grinding? Explain step by step. What tools and equipment should be used? What kind of grinding wheels are best suited to this work? Explain.

Test wheel before using

By V. R. TERRILL
Supervisor of Welding
Boston & Maine
Boston, Mass.

To explain the procedure step-by-step, we should start with the receipt of the wheels. Any evidence of injury to the box or telltale water stains may mean broken or wet wheels. Store wheels in a dry place where you are not "throwing" any other equipment. Wheels stored on welders' trucks should be in cribbed boxes.

Test the wheel before using! This may be done visually and by the ring test. To test a wheel by the ring test you first suspend the wheel by placing your finger through the hole. Next, gently tap the face of the wheel with a non-metallic implement, such as the wooden handle of a screwdriver, about 45 deg either side of the vertical center line and about one inch from the edge of the wheel. Rotate the wheel 90 deg and repeat. A sound, undamaged wheel gives off a clear metallic tone. A dead thud indicates a cracked wheel.

Be sure your grinder does not exceed the maximum safe speed indicated on the wheel blotter. A simple hand-tachometer test every three months or after every repair will establish the speed of the grinding machine.

Never alter the hole in the wheel or force the wheel on the spindle. Use clear, recessed, matching flange washers at least ⅓ wheel diameter. Check flanges for nicks or wear. Tighten the nut only enough to hold the wheel firmly. Before grinding, adjust wheel guard to full protection, check to be sure safety glasses are on and set grinder in motion. However, the operator should not start grinding the frog until the wheel has reached maximum speed.

We use 8-in by 1-in by ¾-in wheels mounted on a flexible shaft attached to a portable grinder and powered by a gasoline-driven generator. In many cases the generator is never taken off the truck.

We tested numerous wheels, supplied by a large abrasive manufacturer, before finding a wheel whose grit was neither too soft nor too hard for our manganese work. The operators tend to favor a soft wheel because of its ability to cut more easily. Of course, it should be kept in mind, the softer the wheel the shorter its life.

Naturally, the best manganese welding techniques are aimed at low temperatures. This applies to grinding as well as welding. An operator should never put his wheel down and just lean on it until he has "slotted" a frog. This subjects the frog to a soaking heat that is liable to embrittle the top layer of metal so that the first bead will not fuse properly.

The work-hardened metal on frog points and wings may start rolling over and closing up flangeways, then the wheel flanges start breaking this metal out. If you grind off this work-hardened metal, you can make your frog last longer.

We use a flangeway gauge to make sure we have opened the flangeway at least 1⅞ in.

If it is necessary to cut a frog in preparation for welding, the cut should be "Veed" out and all sharp corners ground out to avoid concentration of heat at any one spot.

We finish grinding by leaving a 7/16-in radius on both the point and wing so that we can smoothly run the gauge through the flangeways. The frog point should be left 3/16 in below wing level opposite the point (we have a small straight edge with a 3/16-in center extension to measure this) sloping to zero level at 1⅝-in width of point. For example, a number 10 frog would be level across the wings and point 11¼ in back from the point.

Our welding has been cut in half by grinding maintenance—proper grinding at the right time with the correct tools.

Don't rush grinding operation

By D. J. WHITE
Assistant Chief Engineer
New York, Chicago & St. Louis
Cleveland, Ohio

I agree with the rule-of-thumb that more grinding and less welding is important.

The first step our welders take upon arriving at the site is to clean the frog to ascertain if it needs to be built up or if grinding will put the frog back in A-1 condition. Frequently it is found that if a lip or small overhang is ground off the frog is considerably improved and avoids the possibility of hairline cracks. Each welder is furnished a frog gauge to assure that the lip or battered-down portion of the frog can be ground to gauge.

If inspection discloses that the frog is broken, the broken part is removed and the frog ground to make sure that all the break is removed down to good metal. The frog then is built up by the electric welding process using Tempil Stiks to control the heat, making certain that the frog does not become overheated.

After the frog has been built up to approximately ⅛ in above the finished surface, it is ground with a heavy-duty, four-wheel grinding machine, using 1½-in by 12-in grinding wheels. The frog is ground 3/16 in low on the point and tapered back to proper level, a distance of about 6 in from the point. The frog then is dressed on the point edges of the point and wing rails by an electric hand grinder using a 1-in by 6-in grinding wheel, again making sure that the frog is not burned with the grinding wheel by trying to rush the grinding operation.

It is found that the Nickel Plate gets long life out of its manganese frogs by proper maintenance. Frogs are periodically inspected and rough edges removed by grinding when necessary. It is my feeling that a frog loses its life after three or four weldings.

Uses resinoid-bonded wheels

By J. C. BLACKBURN
Supervisor of Welding, MW
Seaboard Air Line
Jacksonville, Fla.

No truer words were ever spoken than "more grinding and less welding" should be done in the care of manganese frogs. However, the

problem goes much further than just that.

Several factors enter into the problem of proper maintenance of manganese frogs in track before they need to be repaired by welding. Excluding manganese frogs that are depth hardened either by peening, pressure or the explosive method, our new manganese frogs have approximately a 250 Brinell hardness. They must work-harden under traffic by deformation to 450 to 500 Brinell hardness.

During the period that these new manganese frogs are obtaining their maximum hardness (depending on traffic tonnage) they lose much of their factory appearance from a grinding standpoint. The top surface of the point and wing-rail sections compresses and flows toward the gage sides, eventually causing the ⅜-in top gage-corner radius to disappear, and closing up flangeways as much as ¼ in. On our railroad, all of our roadmasters, welders and welder helpers realize the importance of maintaining this ⅜-in radius on the top gage corners and the standard flangeway clearance. When this ⅜-in radius becomes a corner we grind, and not before. The above grinding also applies to manganese frogs built up by the electric-arc method of welding.

We use a resinoid-bonded, 16-grit, aluminum-oxide, medium-hard-grade, 8-in by 1-in by ¾-in grinding wheel on a flexible-shaft utility grinding machine. We selected this grinding wheel because it will move manganese metal freely with very little pressure being applied by the operator. Too much pressure exerted on the grinding wheel by the operator will cause heat checks or cracks in manganese which are progressive.

Inspecting trestles for weaknesses

What weaknesses should an inspector look for when inspecting timber trestles? Explain. What tools or equipment are necessary to make a proper inspection?

Divides into two parts

By A. B. Wang
Bridge & Building Supervisor
Monon
Lafayette, Ind.

I would divide the inspection into two parts, top of trestle to caps and bottom to underside of caps.

The rail should first be checked by eye for line. Any variation can usually be traced to a pile condition and be further examined underneath. See that the rails off the bridge are up to surface. An out-of-surface condition there will affect line and surface on the bridge.

From ends of bridge sight along the top of rail for surface. Any variation will indicate wearing down of stringers, caps or piles. Check top surface and sides of all ties. Note excessive checking that cannot be caulked, side splits that go through the ties and bad end splits. Pay particular attention to rail joints.

Check top of stringers, as much as can be seen between ties, for surface checks, noting if ties are wearing into them. Stringers with excessive checking should be renewed.

Note top of caps for checking at ends, plant growth and wear from bottom of stringers.

Bottom inspection can best be made at low water, using a boat if necessary. From bridge ends, note settlement of tops of caps from the level plane.

From bottom, check sides and bottom of stringers for any sign of bad side splits and bottom breaks. Sound sides of stringers with a hammer listening for hollow sounds and take borings if necessary. Follow the same procedure for sides and bottom of caps, noting wear of caps, if any, over piling.

All piling should be checked with a hammer, again listening for hollow sounds. Between high and low water line, be particularly careful to note decay and loss of section. See that all bracing is tight on bolts. If loose, replace bracing if holes in piling are not too large. Note particularly the upstream end piles for wear and movement.

See that guard-rail bolts and stringer tie bolts are in place. For tools, I would use a chaining pin on surface checks, a hammer for sounding timber, and, if no standard borer was available, a small bit with auger for boring the members.

On open-deck trestles

By E. T. Lea
Chief Engineer
Columbus & Greenville
Columbus, Miss.

This answer concerns open-deck, mixed pile and frame-bent trestles and involves a single inspector rather than a party of several persons. The inspector as he nears the trestle from the top portion should look at the approaches to check for swinging track or line defects and also further check the trestle itself for surface and line. Such checks will indicate possible points of failure.

It is well to check the trestle both from the deck and from the ground. From the deck, the inspector starting at one end should proceed from bent to bent looking at condition of ties, guard rail, equalization of bearing of stringers at ends where they rest on caps, mashed or decayed stringers at bearing points and split stringers which are split either adjacent to caps or at middle part of bottom of stringer. He also should look at anchorage of stringers to caps and to each other and anchorage of ties to stringers.

Further, the condition of the top part of bracing, bolting of bracing, and failure of caps by vertical splitting should be checked. Condition of any shims under stringers or other accessory parts should be checked from the deck. At times the inspector will have to get out on the cap and look further at places not otherwise accessible. It is thought best to check walkways and rails by walking over and along them separately rather than try to carry on the inspection with the trestle proper.

From the ground a further check should be made of the caps for indication of soft places by bulges or splits under bearing points. Also check the under side of stringers for any defects such as splits. The condition of bracing at bolts and at ends at ground line should be checked for decay. The piling and posts

WHY IT COSTS LESS TO OWN A CAT GRADER

Most motor graders *look* pretty much alike, no matter who makes them. They handle similar jobs, too, and it isn't always easy to *see* any big difference in the way they handle them. In fact, the manufacturer's suggested prices usually are not greatly different for machines of nearly equal specifications—regardless of the "deal" that may be offered a buyer. But *used* motor graders vary considerably in price. Why?

The Buyer Determines Price

A used machine is priced at what the buyer is willing to pay . . . it's a measure of what *he* thinks is left in a machine. So, with used equipment, the buyer sets the price. This is clearly demonstrated at used equipment auctions. A check of auction prices throughout the country shows, for example, that the Cat No. 12 Motor Grader brings substantially higher prices than comparable machines of other makes—as much as 80% more. (Only machines of the same age, same condition and with similar attachments were compared.) What makes a Cat Motor Grader more desirable than other makes?

A Feature That Affects Cost

Any machine is desirable if it is known to be dependable. This reputation can only be the result of true quality design and quality construction. The Cat oil clutch is a good example. It was designed and is built to give long, trouble-free life. But, how well does it do it? Let's examine the records of just one Caterpillar Dealer who has 161 oil clutch-equipped motor graders in his territory. His records show that in four years he has sold only $24.38 worth of parts for motor grader oil clutches! One machine in his territory went 2524 service meter hours without any work on the clutch. Many users report 2000 hours of service before the first adjustment. In 1000 hours of operation only about .0025 inch of wear can be expected—less than the thickness of a human hair. And, since all parts are constantly bathed in oil there is no need for lubrication maintenance. Less wear, less attention mean not only lower total repair costs but more time on the job . . . less down time. Of course, the oil clutch is just one example of many quality features in Cat Graders.

A Look at Total Cost Records

The cost records of private owners and governmental bodies show which machines cost less. For example, an Indiana county keeps individual cost records on their six motor graders, 14 trucks, three loaders and five tractors. Their records showed that a year-old No. 12 needed only a set of head gaskets and two spark plugs with $25 labor, while two newer graders of another make needed major engine repairs, new clutches and side shift linkage. One town in New Hampshire reports that in over 20,000 hours, their No. 12 has never had a breakdown that held up work more than three hours. Operating costs—24¢ per hour exclusive of fuel, oil and operator. Comparing a Cat No. 12 to another make (after 3½ years' service), the records of an Arkansas county showed a saving of $2478.57 in parts and labor for their No. 12.

What's in It for You

Others have proved that Cat Motor Graders cost less in the long run because they are built better in the beginning. Your Caterpillar Dealer has additional facts and figures on low-cost operation of Cat Graders in your area. Ask him for free Cost Record Books so that you can keep individual machine records on your equipment. Prove to yourself that it costs less to own a Cat Grader.

Caterpillar Tractor Co.,
General Offices, Peoria, Ill., U. S. A.

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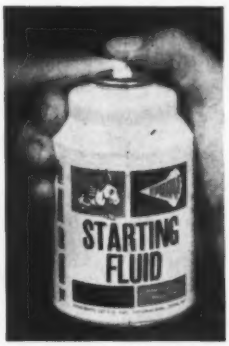

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What's the answer? (cont'd)

should be observed for signs of and any apparent unusual movements. The inspector also should check sills for splits or churning condition and check bents for departure from the vertical position. In dry weather, where piles do not have sufficient penetration due to hard underlying strata, the earth around the pile is apt to dry and shrink leaving a crack around the pile. This causes loss of skin friction. The inspector should look out for such a condition because this causes a pile to churn and broom the ends. The condition can be helped by filling the crack with sand to build up the skin friction.

The inspector also should look for the collection of drift and the accumulation of combustible matter, such as bird nests. Also, where there is a large volume of run-off water the possibility of scour and undermining of piling should be checked. The headwalls also should be inspected from the ground for signs of failure. Headwalls are more apt to fail in times of heavy rainfall from additional earth pressure or being undermined by scour. It also would be well to observe conditions existing upstream from the trestle a short distance to check on any possible drift that might come against the trestle with future heavy rains.

The best device for inspection is experience and a good trained eye, with the sunlight directed towards the point of vision. A pointed metal bar ¾ in. in diameter and about 4 ft long, with an enlargement at one end of about 2 in. in diameter, will be found useful for sounding possible decayed timbers. The pointed bar should be used with caution, however, as there have been timbers punched to such excess that premature decay was promoted. A small ruler and a 50-ft tape will be found useful, as well as a yellow lumber crayon for marking defects on timbers.

Lists locations to inspect

By C. E. WACHTER
Bridge & Building Master
Canadian National
Port Arthur, Ont.

The major parts of the trestle should be checked as follows:

(1) Piling—Especially at, and just below, ground line and at cut-off just under caps.

(2) Caps—Especially under stringers.

(3) Stringers—Especially at joints over caps, and those that have holding spikes to retain deck in line.

(4) Ties—Especially under tie plates or tie pads.

If a good record is kept of the age and type of material in a structure the inspection is not too difficult. Beyond the point of defective materials is the fact that settlement of piling may have taken place. However, during recent years, with the use of modern pile-driving equipment, settlement has not been too common.

By watching traffic pass over the structure the weaknesses of piling, caps and stringers can be noted by undue motion at various points. A pointed bar can be used to check piling for rot at the ground line and immediately below the ground line. When ties are suspected of being rotten under tie plates and tie pads the pointed bar again can be used.

Where there is undue movement at the points where caps rest on piles or stringers rest on caps there is a strong possibility that the timber has rotted inside. To check this factor it is necessary to use a coring auger. A core can be taken out of the cap just above the pile cut-off and just below the stringer. An angled hole can be bored into the stringer, working from the edge of the cap up to the stringer joint. The cores will show the extent of rot and will determine the necessity for rebuilding or repairing the trestle.

After the coring auger has been used the holes should be treated and plugged to prevent further rotting.

As a rule the outside stringers on a bridge have lining spikes, or lag

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screws, which hold the track in line. These stringers have a tendency to deteriorate faster than the remaining stringers. A pointed bar can be used for testing these stringers when it is determined that testing is necessary.

As previously pointed out, if complete details were kept in regard to age and type of material the inspection can be minimized.

Transposing rail on curves

What factors determine when worn rail on curves should be changed or transposed? Explain. When transposed, should the rail be turned? Why?

Wide gage

By C. P. MARTINI
Roadmaster
Soo Line
Stevens Point, Wis.

Economic conditions seem to carry a lot of weight regarding what can be done in the matter of changing out rail on curves. To get the maximum life out of rail on curves good gage is very important. When we were using steam locomotives it was good practice to have a gage wider than 56½ in as standard on sharp curves. Now that diesels are being used this is no longer true and even sharp curves should be kept to standard gage.

When the gage gets much over ½ in wide, due to wear of the rail, excessive rail damage will start on the inside rails of the curve. The car wheels wear pretty much to the pattern of the rail, and as the gage widens this "false flange" rides in on the rail on the low side of the curve causing rapid wear of this rail.

Gage can be corrected by respiking, but rails on most sharp curves have four to six spikes per tie plate and often additional hold-down spikes. Removing these spikes, plugging the holes and respiking the rail does considerable damage to the ties and requires much work. A better solution is to change out the high, or outside, rail with full-ball rail to restore the gage.

Transposing of rail on curves is often done to prolong the rail life. There is an element of risk involved, however, since the rails on curves have a different shape, due to wear, than was originally designed. When the rails are transposed this change in shape often puts the weight of the load on the extreme edge of the head of the rail instead of distributing the load to the entire head as was intended in the original design. This change in loading is a factor in the development of split-head rails on curves.

If causing wear on angle bars

By J. H. BECKER
Section Foreman (Ret.)
St. Louis-San Francisco
Festus, Mo.

My experience with worn rail on curves is to change out the rail when it is worn enough to cause wear on

(*Continued on page 44*)

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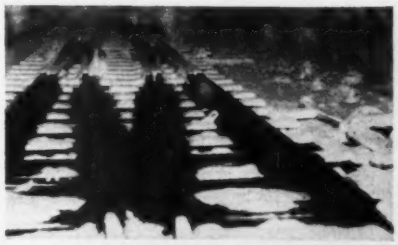

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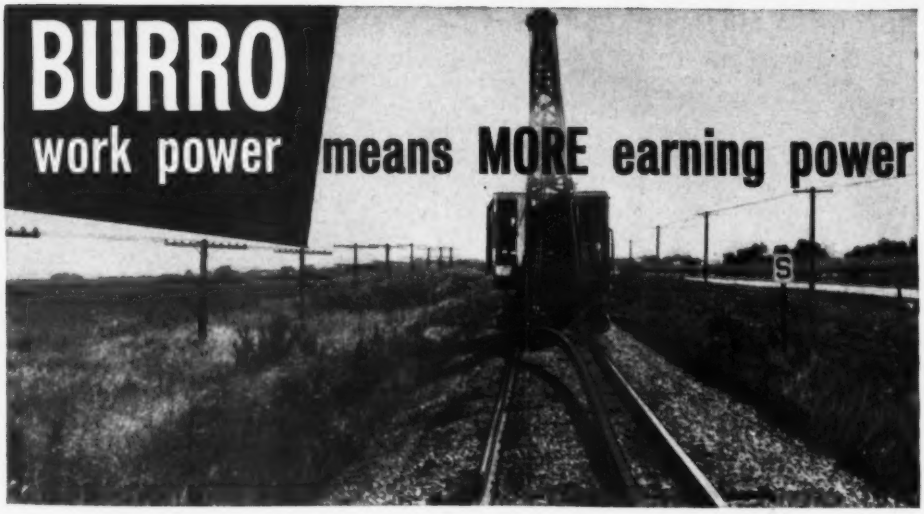

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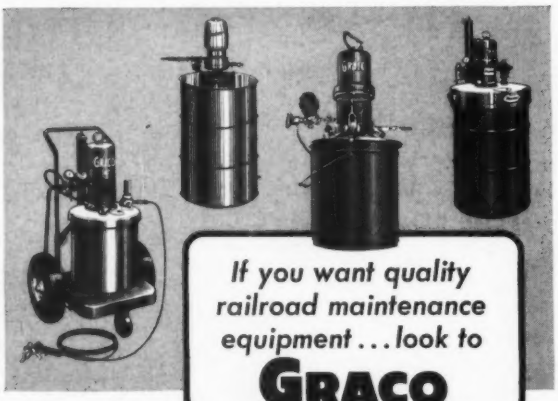

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142. Lubrication Guide—Gulf Oil offers 88-page illustrated booklet on the lubrication and maintenance of engines, air tools, wire rope and earthmoving equipment. Railroad men will find information very helpful. (Page 6)

143. Rail Lubricator—American Car & Foundry Division will send literature on its M&S grease-type rail lubricator. Also on its M&S one-piece rail anchor (No. 144 on card), and M&S switch-point protector (No. 145). (Page 19)

146. Supervisory Training—Offers folder describing home-study course for railroad men. (Page 48)

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147. Steel Liner Plates—Catalog LP-7861 describes use of these units to line old structures, and as underpasses, tunnels, caissons and storage bins. Tables, charts and other information are included. *Armco Drainage & Metal Products, Inc.*

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149. Track Jack—Bulletin AD-115 describes new 15-ton Model 717-BA jack. *Duff-Norton Company*

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151. Power Truck Gates—Form PG-6005 describes Daybrook models. *Young Spring & Wire Corp.*

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153. Concrete Form Hardware—Catalog 1961 is available which describes and illustrates the Williams line of form hardware for concrete jobs. Charts, tables and drawings give engineering information. *Williams Form Engineering Corporation.*

154. Steel Framing Angles—Booklet AD-410 tells how Acme AIM Brand Slotted Angles can be used to construct storage racks, platforms, mezzanines, stairways, scaffolding, tables, work benches, building framework, etc. *Acme Steel Co.*

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200. Hydraulic Spike Puller—Model CHP is designed to pull spikes from both rails with one gun. (Page 32)

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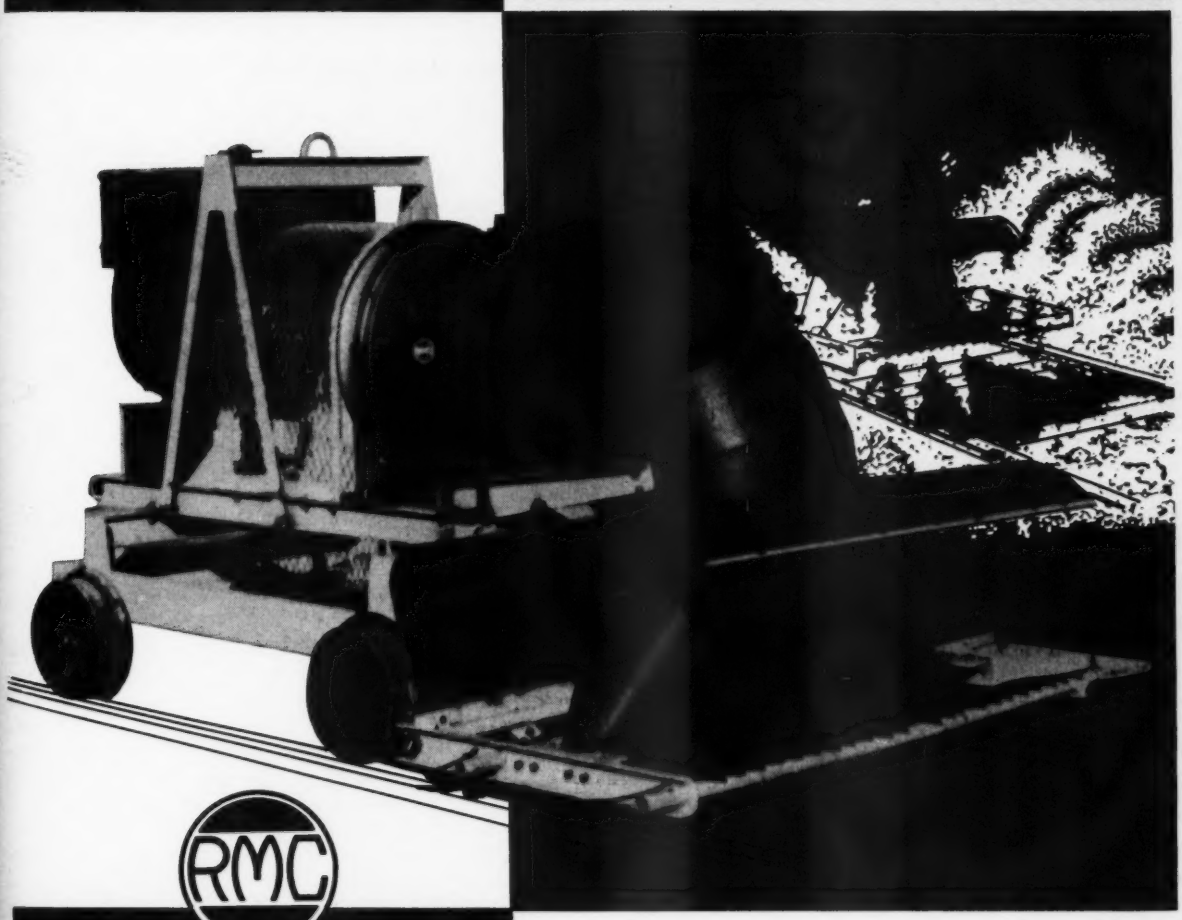

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What's the answer? (cont'd)

(*Continued from page 39*)

angle bars. At this stage of wear you are getting a very sharp ball. This condition I would say is dangerous since a worn flange on a car wheel could climb the worn ball and cause a bad accident. I would suggest the rail be changed before it gets that bad since it will be necessary to change out the rail in a short time anyway. By doing this you will have a much better rail to relay. When the rail is relaid I would suggest that it be turned. If this is not done a car wheel will not properly bear on the head of the rail and probably will cause a lot of bad joints. My experience has been to turn the rail when badly worn rails are relaid. Then, you will have a fairly good ball for your running side.

Using pretressed concrete piles

What problems are involved in the use of prestressed-concrete piles? Explain. How can cut-offs be made? Can splices for extensions be made? Explain.

Gives detailed instructions

By Louis Lange, Jr.
Assistant Engineer
Seaboard Air Line
Hialeah, Fla.

Problems arising from the use of prestressed concrete piles can be grouped under the headings of handling, jetting and placing, and driving.

Handling: Here, as with precast concrete piles, it is essential that the piles be picked up and stored properly from the time the concrete has reached its required strength to the setting of the piles in their templates. Prestressed piles have less chance of developing horizontal cracks as a result of poor handling than precast piles. However, this does not permit any laxness in seeing, that a two-point pick up is used at all times until the pile is ready to be placed, and that when the pile is in transit or being stored a properly spaced two-point support is provided.

Jetting and placing: From experience gained after working in the different types of soil (clay, coarse and fine sandy material, and medium compact rock) found in South Carolina, Georgia and Florida it has become standard procedure to jet a hole to receive the pile. As a general rule a pile will take up and reach the required bearing in 5 to 10 ft of driving in undisturbed stable soil. In order to obtain sufficient penetration it is therefore desirable and expedient to jet a hole, guided by a template which is true to the final alinement of the pile, no deeper than within 10 ft of the desired tip elevation. The tip elevation and length of pile is determined by evaluating data obtained from core drillings. A 3-in jet pipe with a 1¾-in nozzle and a jet pump capable of supplying 120 lb of pressure has been found to work very efficiently. It also can be used as a punch for braking up medium compact rock strata located beneath sandy material where a composite pile has proved to be ineffective.

Driving: In driving a pile the trueness of the jetted hole largely determines whether good or poor alinement will be maintained during driving. This is especially true where only an upper template can be utilized. Even though care is exercised in jetting the pile hole it is still possible for the tip of the pile to run out of alinement. This can be corrected by prudent jetting on the side opposite the direction in which the pile tip is running and not permitting the jet pipe to go below the pile tip.

Replacing a cushion block when its usefulness is in doubt can prevent many a shattered pile (oak is a reliable cushion-block material).

Making cut-offs: Cut-offs can be made with a carborundum blade, rock drill, or pneumatic hammer; the last two methods being more economical and faster. When driving under traffic for a quick cut-off above top of rail a pneumatic paving breaker or two 40-lb chipping hammers will give the fastest results. For making the final cut-off a chipping hammer does the most satisfactory job with less chance of breaking off the pile corners below the bottom of the cap. Placing a ¼-in by 1½-in metal band around the pile at cut-off elevation will aid appreciably in making a good cut-off. After the concrete is removed from around the prestressed wires, the wires are cut with a torch allowing the butt to be broken off.

Making splices for extensions: If it becomes necessary to drive a prestressed pile below cut-off elevation in order to get the required bearing a field splice can be made by exposing enough wire to tie to reinforcing steel so that a reinforced concrete pile extension can be made. Design of the splice should call for the use of dowels.

Quotes AASHO-PCI standards

By N. L. Scott
Executive Secretary
Prestressed Concrete Institute
Chicago

Several guides now are available to the engineer for using prestressed concrete piles. A joint committee of the American Association of State Highway Officials and the Prestressed Concrete Institute has just released standards for square and octagonal prestressed concrete piles. The standards cover sizes from 10 in to 24 in. in diameter. Two books now cover the design and use of prestressed piles; i.e., Practical Prestressed Concrete, by H. Kent Preston (McGraw-Hill), and Pile Foundations, by Robert S. Chellis (McGraw-Hill). Much useful information on prestressed concrete piles also was included in an article "Pretensioned Concrete Piles—Present Knowledge Summarized," by T. Y. Lin and W. J. Talbot, Jr., *Civil Engineering*, May 1961. Reprints of this article and copies of the AASHO-PCI pile standards are available from the Prestressed Concrete Institute, 205 West Wacker Drive, Chicago 6, Ill.

Perhaps the simplest and quickest way to make a pile cut-off is with a light concrete chipping hammer. This small hand tool makes a clean cut-off in a relatively short time. The strands either can be allowed to ex

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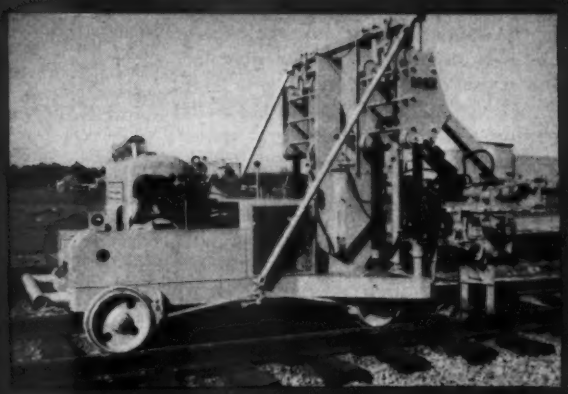

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What's the answer? (cont'd)

tend into the cast-in-place cap or they can be burned or sheared off.

The AASHO-PCI pile standards make provisions for both build-ups and splices between precast sections. The standards provide complete details for build-up without driving and build-up with driving. The standards make the following provisions for splices:

"Two precast pile sections may be spliced by providing cored or drilled dowel holes on both sides of the splice. The dowels shall have an area equal to 1½ per cent of the gross cross-section of pile and shall be adequately bonded into both sections. The dowel holes and space between spliced sections shall be filled with a material having properties fully equal to that of the concrete and adhesive strength equal to the shear and tensile strength of the concrete. Such properties shall be obtained within a time limit consistent with the driving requirements of the pile.

"Any alternate method of splicing providing equal results, may be considered for approval.

"If the joint between sections is exposed and subject to conditions which would cause deterioration, suitable steps satisfactory to the engineer shall be taken to protect the joint."

The alternate methods mentioned above might include the use of a plate embedded in the top of the driven pile and welded to a matching plate in the bottom of the spliced section. Metal sleeves also have been successfully used in several sections of the country. In Honolulu, 180-ft octagonal prestressed piles were driven in 60-ft sections connected with snug-fitting metal sleeves with steel dowels used for alinement.

Biographical briefs

(*Continued from page 16*)

Robert D. Walter, 33, who was recently promoted to assistant division engineer on the Erie-Lackawanna at Hornell, N. Y. (*RT&S*, Sept., p. 10), was born at Corydon, Ind., and graduated from Tri-State College in 1952 with a Bachelor of Science degree in civil engineering. Mr. Walter entered railway service on the Erie in 1952 as a levelman at Hornell, being transferred to Suffern, N. Y., the following year. He was promoted to transitman there in 1955, to construction inspector at Mansfield, Ohio, in 1956, to senior construction inspector at Meadville, Pa., in 1957, also serving in the latter capacity at Cleveland, Ohio, and to assistant engineer at Cleveland in May 1960. Mr. Walter was advanced to office engineer there six months later, the position he held at the time of his recent promotion.

James H. Langston, 28, who was recently promoted to roadmaster on the Frisco at Chaffee, Mo. (*RT&S*, Sept., p. 10), was born at Jefferson City, Mo., and graduated from the University of Missouri in 1959 with a Bachelor of Science degree in civil engineering. He entered the service of the Frisco in February 1959 as a junior engineer at Chaffee, being promoted to student apprentice at Amory, Miss., five months later. Mr. Langston was further promoted to assistant roadmaster at Tulsa, Okla., in 1960, the position he held at the time of his recent promotion.

T. Dabney Kern, who was recently promoted to assistant to chief engineer on the Illinois Central at Chicago (*RT&S*, Sept., p. 10), graduated from the University of Virginia in 1949. Mr. Kern entered the service of the IC in 1940 as an engineering apprentice on the Kentucky division, subsequently serving as chainman and rodman. During World War II he was in the U. S. Army. After graduation from college, he returned to the IC as an instrumentman on the Kentucky division. Subsequently he served as track supervisor, assistant to division engineer and division engineer at various locations. Mr. Kern was promoted to office engineer at Chicago in 1957, the position he held at the time of his recent promotion.

John W. Lager
Illinois Central

R. E. Franklin
RMC

John W. Lager, who was recently promoted to special engineer on the Illinois Central at Chicago (*RT&S*, Sept., p. 10), is a graduate of the University of Illinois. He entered the service of the IC in 1950 as a junior engineering aid on the former Springfield division, subsequently serving as assistant supervisor and supervisor. Mr. Lager was promoted to supervisor bridges and buildings on the Springfield division in 1956 and to assistant engineer at Chicago in 1960. He was serving in the latter capacity at the time of his recent promotion.

Supply trade news

ARMCO DRAINAGE & METAL PRODUCTS—William A. Johnson has been appointed regional engineer, railroad sales, Pacific region, at Berkeley, Calif., succeeding **George W. Sondag** who retired recently.

FAIRMONT RAILWAY MOTORS—NORTHWESTERN MOTOR CO.—Fairmont Railway Motors, Inc., Fairmont, Minn., has purchased all of the capital stock of the **Northwestern Motor Company,** Eau Claire, Wis., which will now be operated as a wholly-owned subsidiary, according to an announcement. Fairmont district sales of-

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fices and representatives will solicit orders for Northwestern products. The announcement states that all orders should continue to be addressed to the Northwestern Motor Company at Eau Claire. **Richard G. Wade,** chairman and president of Fairmont Railway Motors, will serve as chairman of the reorganized Northwestern Motor Company.

Other Fairmont officials are: **C. H. Johnson,** vice chairman; **Robert E. Porter,** secretary, and **Frank W. Kasper,** treasurer. **Jasper A. Berlin,** Chippewa Falls, Wis., will continue as president of the Eau Claire company.

RAILROAD ACCESSORIES CORPORATION— **Robert I. Becksted** has been appointed Canadian representative, with headquarters at Montreal, Que. Mr. Becksted recently retired as signal engineer, Eastern region, Canadian Pacific.

RAILWAY MAINTENANCE CORPORATION— **Richard E. Franklin** has been elected vice president in charge of manufacturing, engineering and spot car repair systems.

Obituary

Rowland B. Hill, a manufacturers' representative at Chicago, died on October 18 of a heart attack.

Association news

Metropolitan Maintenance of Way Club

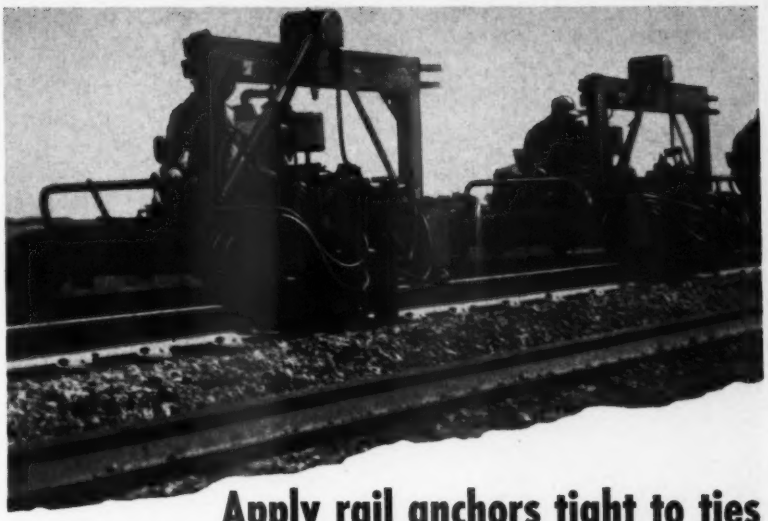
On December 7 the club will hold a luncheon meeting, with the social hour starting at 12 noon, at the Railroad-Machinery Club, 30 Church St., New York. The program will consist of two motion pictures, one produced by the AAR and the other by the NYCTA. The AAR film is entitled "Science Rides the High Iron" and demonstrates modern railroad technology. It is narrated by Chet Huntley. The NYCTA film is entitled "Daily Miracle." It depicts the operating procedures of New York's subway system.

Mississippi Valley Maintenance of Way Club

The December meeting of the club will be held on the 11th in the Louis IX Room, Fred Harvey's, Union Station, St. Louis, Mo. Principal speaker will be A. Carl Weber, director of research engineering, Laclede Steel Company. The subject of Mr. Weber's address had not been announced at the time this issue went to press. As usual, the social hour will begin at 5:30 pm, with dinner starting at 6:30.

Northwest Maintenance of Way Club

The next meeting of the club will be held on December 14 at the usual location, Coleman's Restaurant, Ford Parkway, St. Paul, Minn. The program will be presented by R. H. Beeder, chief engineer,



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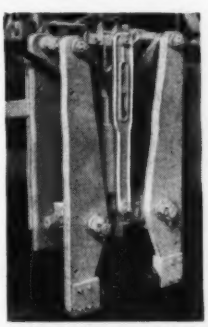

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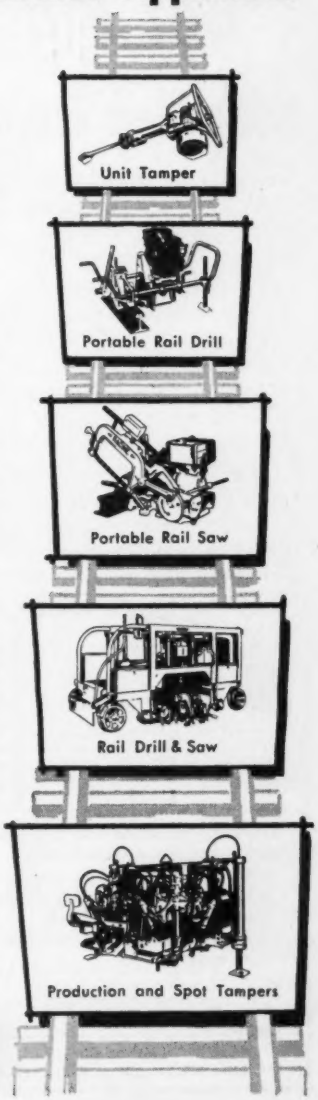

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system, Santa Fe, and will consist of a colored motion picture prepared by the Santa Fe depicting the construction of its new line between Williams and Crookton in northern Arizona. Mr. Beeder will discuss some interesting phases of the project. Dinner will be served at 6:30 pm, preceded by the usual social hour.

Maintenance of Way Club of Chicago

Principal speaker at the December meeting of the club, to be held on the 18th, will be Virgil E. Gunlock, chairman of the board, Chicago Transit Authority. Mr. Gunlock will speak on "Who is going to move the people and how?" The address will give his views on handling the growing transportation problem in Chicago.

The meeting will be held at the usual location, the Midland hotel, 172 West Adams Street, Chicago. The social hour will commence at 5:30 pm. Dinner will be served at 6:30.

American Railway Engineering Association

At a meeting of the AREA's Board of Direction, held on November 10 at association headquarters, Chicago, the personnel and assignments of all technical committees for 1962-63 were approved. In addition, plans for the 1962 annual meeting were progressed. This meeting will be a 1½-day affair to be held at the Conrad Hilton hotel, Chicago, on March 9-10.

At press time only one standing committee had scheduled a meeting in January. This committee is: Economics of Railway Labor, January 15, Sheraton-Jefferson hotel, St. Louis, Mo.

AT&SS plans 1962 exhibit

Preliminary plans for the exhibit to be held next September by the Association of Track and Structure Suppliers were one of the main items of business discussed at a meeting of the association's board of directors at Chicago on November 13. This was the final meeting of the outgoing board of directors and, at the same time, the initial meeting of the new board as elected at the annual meeting on September 20. Ray T. Johnson, Jr. (Mid-West Forging & Manufacturing Co.), outgoing president, presided during the first part of the meeting, and P. J. Wolf (Maintenance Equipment Company—Railway Maintenance Corporation), incoming president, directed the latter part of the session.

Exhibits of the AT&SS are held in conjunction with the annual meetings of the Roadmasters' Association and the Bridge & Building Association. As outlined at the board meeting, both the exhibit and the meetings will be held next year at McCormick Place, Chicago, with the doors of the exhibit opening on Monday, September 10, and the three-day meetings starting on Tuesday.

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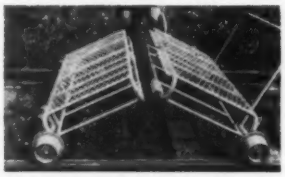

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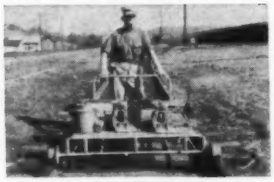

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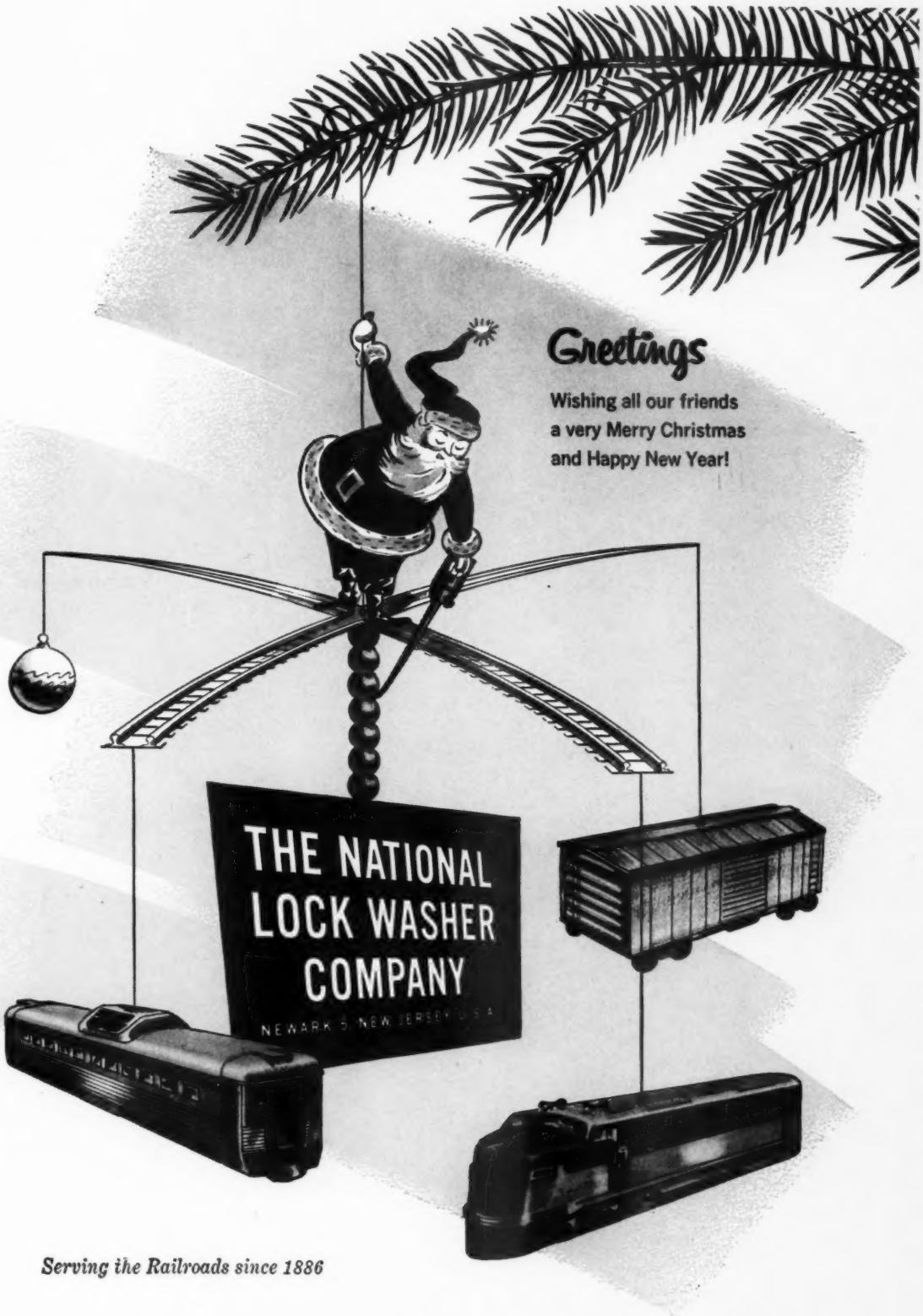

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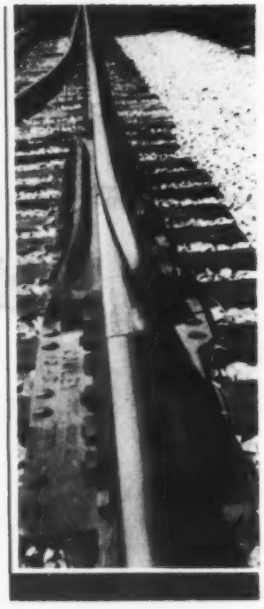

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